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MEDICAL AND SURGICAL REPORTS

OF

THE BOSTON CITY HOSPITAL.

Twelfth Series.

EDITED BY

HERBERT L. BURRELL, M.D., W. T. COUNCILMAN, M.D.,
AND CHARLES F. WITHINGTON, M.D.

BOSTON:
PUBLISHED BY THE TRUSTEES.
1901.

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PREFACE.

The report is now established as an annual publication, the manuscript for it being due on October 1st of each year, and with the co-operation of the contributors the editors hope to be able to issue the report on December 1st of each year.

The illustrations and binding of this report have been paid for by a sum of money placed at the disposal of the editors by the Boston City Hospital Alumni Association.

The Editors.

December 1, 1901.

A LIST OF THE TRUSTEES, THE MEDICAL AND SURGICAL STAFF, AND THE HOSPITAL OFFICERS.

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I.

AN ANALYSIS OF NINE HUNDRED AND FORTY-NINE CASES OF PNEUMONIA.

By George G. Sears, M.D., and R. C. Larrabee, M.D.

The 949 cases, which form the subject of this paper, have been taken from the second and third medical services in the years 1895 to 1900 inclusive. It was our intention to use all cases of pneumonia admitted during that period, but the number was so great that we have confined ourselves chiefly to those years which included the term of service of one of the writers, either in the capacity of House Officer or Visiting Physician. Many cases in which the diagnosis of pneumonia was made have been excluded as useless for statistical purposes, either because they were admitted after the physical signs and temperature had disappeared, or because the records were silent on many essential features. Children under 15 have been also excluded.

The smallest number of cases occurred in the late summer and early fall months, the largest in winter and early spring. August showed the least, 21, after which there was a gradual rise until the climax was reached in March with 149 cases. After April, in which 146 occurred, there was a rather sudden fall. The remaining months gave the following figures: January 92, February 116, May 96, June 49, July 34, September 32, October 60, November 72, December 82.

The preponderance of males over females (714 to 235) can be accounted for only in part by the larger number of male beds in the Hospital available during these years. It is better explained by the more frequent abuse of alcohol by men and by the greater exposure to which they are subject from their occupations, whose influence as a factor is shown,

though not emphatically, by the fact that of 544 men in whom it was possible to classify their vocations over 60 per cent. (340) worked out of doors.

While nearly two-thirds of the cases occurred in patients under 40 years of age too many outside factors have to be considered to make our figures of any value in estimating the susceptibility of various ages to the disease. Its occurrence by semi-decades among our patients is given in Table A.

TABLE A. — MORTALITY ACCORDING TO AGE.

AGE.	Number of Cases.	Number Died.	Mortality.	AGE.	Number of Cases.	Number Died.	Mortality.
15-19	66	7	10.6	45-49	83	32	38.5
20-24	110	20	18.2	50-54	57	22	38.6
25-29	119	30	25.3	55-59	36	19	52.8
30-34	120	35	29.2	60-69	48	29	60.4
35-39	121	45	37.2	70+	19	15	78.9
40-44	108	37	34.3				

Hereditary predisposition is hardly suggested, since only 51 gave a history of its occurrence in other members of the family. The proportion is so small, a little over five per cent., that it is probably a coincidence.

Among exciting causes exposure and alcoholism were most frequently given, either separately or combined, but in a large proportion the patients were unable to give any explanation for their attack.

Contagion was suggested in only three instances, and in one of these the record states that the brother and sister affected did not live together, although visiting was possible.

Premonitory symptoms were present in nearly 20 per cent. of the cases, and consisted of general malaise, headache, or cough. Bronchitis was a frequent precursor, 140 patients having complained of a "cold" which had lasted from a day or two to over two weeks before the distinctive features of the disease came on, and had apparently prepared the way for the entrance of the specific germ.

In 660 cases the disease began suddenly; in 466 with a chill. In 4 the first symptom was a hemorrhage, while in the others it began with pain in the side, cough or marked digestive disturbances, either vomiting or diarrhoea. In 126 cases the onset was gradual, at times so insidious, that like typhoid, it was impossible to accurately determine the date of its beginning.

The similarity to typhoid in certain cases was further accentuated by the presence of nose-bleed, which occurred in 19 cases out of 411 in which this symptom was especially looked for.

Cases analagous to the "walking" form of typhoid were occasionally found where patients, almost irrespective of the amount of lung involved, performed even hard manual labor for several days after the initial chill, for instance, a driver with the right upper lobe involved kept at his occupation throughout the disease and did not apply for admission until after the crisis. A majority of these cases were evidently mild, yet about a quarter of them died. Alcohol undoubtedly played a part in furnishing some of them with sufficient courage to rise superior to the disease.

Cases were not infrequent with marked abdominal symptoms, at times so conspicuous as to mask the true condition, which was revealed only on physical examination of the chest. In 238 cases, in which their presence or absence was particularly noted, nausea or vomiting occurred 45 times, diarrhœa 20 times, and both nausea and diarrhœa 12 times, a total of 77 (nearly 33 per cent.). In connection with these digestive disturbances appendicitis or some acute abdominal inflammation was occasionally suggested as the cause of the symptoms by the presence of pain below the costal margin, usually on the right side, and often combined with a local rigidity of the abdominal muscles; one such case entered the surgical side for immediate operation.

Jaundice, usually slight, was noted in 29 instances, 2 of whom also had hepatic cirrhosis, while a third gave a history of hæmatemesis a year before, and probably also had cirrhosis. We suspect that our figures by no means state the frequency of jaundice, which seemed to depend a good deal

on the attention paid to it, since the admission of a well-marked case apparently stimulated interest in this special point, and was usually followed by a group of similar cases. It appeared at any time during the course of the disease, but more rarely during convalescence, one patient being admitted markedly icteric on the 3d day, while in another it was not noted until the 24th. It came on before the 8th day in 12 of 16 cases in which it was possible to date the beginning, and before the 5th in 5. Thirteen out of 29 cases died, but no relation between the severity of the disease and the amount of the jaundice could be found. Six cases came to autopsy, one of which showed gumma of the liver, one hepatic cirrhosis, and one a distended gall-bladder. In the other 3 cases, 2 of which were examined microscopically, no abnormality of the liver or bile passages was noted.

The right lung was affected nearly twice as often as the left (522 to 276), and when one lobe alone was involved, which happened in considerably over half the cases (590 out of 931), in which the records were explicit, the right lower was the favorite site, though the left lower was a close competitor. In 134 cases, classed as double in Table B, portions of both lungs were affected. Our cases give but little support to the statement, so generally made, that the disease is more fatal or even more severe when it attacks an upper lobe. If cases with one or two lobes involved are compared the difference in the death rate is slightly in favor of the upper lobe, when two are attacked, and less than 3 per cent. against it where the disease is confined to one. A comparison of cases with three lobes affected shows a much greater discrepancy, but the number of those in which the upper lobe was not affected was so small (8) as to make the figures of little value. On the other hand delirium was recorded slightly more often against the lower than the upper lobes, as was also the frequency of albuminuria, but on all these points the difference in the percentages was too slight to be conclusive. Nor could a marked influence on the length of the course according to the site of the process be determined, complete defervescence occurring at about the same time, irrespective of whether the apex or base of

the lungs was attacked. The extent of lung involved, however, produced a decided effect on the severity of the disease, both the proportion of deaths and the proportion of cases with albuminuria steadily increasing with the number of lobes affected. The only exception occurred among the

TABLE B.

LOBE OR LOBES AFFECTED.	No. of Cases.	Per cent.	No. Died.	Per cent.	No. of Cases used to obtain	Average day of Defervescence.	No. of Cases with Delirium.	Per cent.	Pericarditis.	Jaundice.	Meningitis.	Phlebitis.	Cases without Albumen.	With trace or less.	With large trace.	With ⅓ % +.	Per cent. of cases with Albumen.
Upper Right.....	97	10.4	31	....	....	....	22	....	3	2	..	2	23	44	9	2	
Upper Left.....	41	4.4	15	....	....	....	12	....	1	0	..	0	5	23	3	3	
Total Upper.....	138	14.8	46	33.3	73	10.4	34	24.6	4	2	..	2	28	67	12	5	75.0
Lower Right	231	24.8	75	....	....	....	67	....	2	3	..	0	40	119	30	4	
Lower Left.....	196	21.0	56	....	....	....	53	....	1	5	..	2	42	94	24	7	
Total Lower.....	427	45.8	131	30.6	242	10.2	120	28.1	3	8	..	2	82	213	54	11	76.5
Middle Right.....	25	2.7	6	24.0	20	9.2	5	....	0	2	..	0	6	10	0	2	66.7
Whole Lung Right....	66	7.1	40	60.6	23	9.9	23	....	3	2	1	0	5	36	11	2	90.7
Whole Lung Left.....	39	4.2	21	53.8	16	12.7	14	....	1	1	..	0	2	22	4	0	92.9
[1]Two Lobes, including Upper.....	58	6.2	17	29.3	18	11.7	24	34.4	1	7	1	0	10	32	6	2	80.0
Other two Lobes.....	136	14.6	51	37.5	67	9.3	50	36.7	2	3	2	3	23	77	12	6	80.5
[2]Three Lobes, with Upper.....	25	2.7	17	68.0	7	11.5	9	36.0	3	2	..	3	5	14	4	2	80.0
Other three Lobes.....	8	.9	2	25.0	5	8.2	3	37.5	0	2	..	0	1	4	0	1	83.3
One Lobe.....	590	63.4	183	31.0	335	10.2	159	26.9	7	12	..	4	116	290	66	18	76.1
Two Lobes.....	233	25.0	89	38.2	121	10.5	88	37.3	4	11	3	3	35	131	22	8	82.2
Three Lobes	99	10.6	60	60.6	35	9.9	35	35.4	6	6	1	3	11	54	15	5	87.0
Four Lobes	8	.9	5	62.5	2	17.0	4	50.0	1	0	..	0	2	4	0	2	75.0
Five Lobes.....	1	.1	1	100	0	....	1	100	0	..	..	0	0	1	0	0	100
Double Pneumonia...	134	14.4	57	42.5	....	....	....	....	5	..	..	2	23	73	10	8	79.8

[1] Excluding left lung

[2] Excluding right lung.

cases where four lobes were involved, in which the cases with albumen were relatively less numerous, but they were so few that this was probably accidental. The relative frequency of delirium and the average day of complete defervescence showed a similar tendency, but in each case exception must

be made where three lobes were invaded. The proportion of cases with complications is so small that one can make no definite statement other than that they were relatively more frequent when more than one lobe was involved.

Our cases of double pneumonia show a high death rate, which is only natural, considering the extent of lung affected.

That pneumonia is essentially a disease with high temperature is well shown by our cases, for of 740 in which more than one thermometric observation was made after admission before defervescence or death, but 46 kept under 102°; in 354 the highest point recorded was from 102° to 103.9° inclusive; in 323 it was from 104° to 105.9° and in 17 it was 106° or over. One case, a drunkard, which developed under observation, ran a normal temperature throughout its course,

TABLE C. — MORTALITY BY TEMPERATURE, PULSE AND RESPIRATIONS.

TEMPERATURE.	No. Cases.	No. Died.	Mortality.	PULSE.	No. Cases.	No. Died.	Mortality.	RESPIRATIONS.	No. Cases.	No. Died.	Mortality.
Below 100°	3	3	100	Below 100	36	0	0	Below 30	45	4	8.9
100°–101.9°	43	23	53.5	100–109	86	6	7.0	30–39	200	32	16.0
102°–102.9°	124	47	37.9	110–119	101	13	12.9	40–49	288	95	32.9
103°–103.9°	230	72	31.3	120–129	235	59	25.1	50–59	107	61	57.0
104°–104.9°	230	68	29.6	130–139	117	63	53.8	60–69	82	52	63.4
105°–105.9°	93	33	35.5	140–149	97	65	67.0	70+	18	13	72.2
Over 106°	17	11	64.7	Over 150	68	51	75.0				

Table C is based upon the highest recorded temperature, pulse and respirations of every patient in whom more than one observation was made before defervescence or death. A single record of high temperature just after entrance has been ignored, since it was possible that it resulted more from the shock of moving than as an incident of the disease. As will be seen by reference to the table the greater danger lies at the two extremes, over 55 per cent. dying when the temperature failed to reach 102° and nearly 65 per cent. when it exceeded 106°. In the former case the influence of age

and general condition must be considered, since the lower temperatures are apt to occur in the later periods of life, when pneumonia is more fatal, and also in drunkards and debilitated individuals. Of the 46 cases with temperature under 102° 18 were over sixty, and only 18 others were under fifty, and of the latter 10 were very alcoholic, and four were much debilitated or suffering from other organic diseases. In many of the cases which exceeded 106° the temperature was proagonal. The greatest safety was found between 103° and 105°. In a series of 353 cases compiled by Wilson Fox from Thomas, Schrötter and Bleuler a very striking contrast was shown by comparing the deaths above and below each degree of temperature, the mortality increasing, except over 105° almost progressively in inverse ratio to the temperature. A reference to table D will show that this is also true in our cases.

TABLE D. — MORTALITY AT GIVEN TEMPERATURES.

TEMPERATURE.	Over 105°	Under 105°	Over 104°	Under 104°	Over 103°	Under 103°	Over 102°	Under 102°
Number of cases....	110	630	340	400	570	170	694	46
Number died.....	44	213	112	145	184	73	231	26
Mortality	40	33.1	32.9	36.3	30.9	42.9	33.3	56.5

In connection with a high temperature a high pulse rate is also to be expected since it exceeded 120 in nearly 70 per cent. of the cases. The limit of comparative safety seems to be at 120, although the rise in the death rate is not very sudden until 130 is reached, over which point more than half the cases died. The rapidity of respiration has a decided influence on prognosis, since less than 9 per cent. died with a rate under 30, and less than 15 per cent. under 40. The latter seemed to mark the limit of comparative safety, as the ratio rose steadily and rapidly from that point, yet respirations of 70 or more in an adult were not incompatible with recovery.

The above statements regarding the fever in pneumonia are based on a study of the highest recorded temperature of

each case, as the simplest and most practical method for statistical purposes, but clinically it would be impossible to classify an individual case by any such standard until after the crisis. We have therefore attempted to group them on broad lines according to the general run of the maximum daily temperature. In making this classification we have tried to eliminate our personal equation by using only the more obvious cases among those which were under observation for three days or more before death or crisis. The results obtained were even more striking than where the highest records were compared. Out of 86 cases where the general run was under 102° 38 (44.1 per cent.) died, out of 297 where it was between 102° and 104° 90 (30.3 per cent.) died, while only 12 of the 71 cases (16.9 per cent.) where its course lay between 104° and 106° ended fatally.

While the temperature as recorded on the morning and evening chart might show but slight variations, a large proportion of cases in which more frequent observations were made showed wide fluctuations in the twenty-four hours, often amounting to three or even more degrees and continuing during the entire course of the fever, an irregularity quite as marked as in many cases of typhoid. This has an important bearing on the interpretation of those sudden intermissions in temperature which interrupt the course of the daily chart and suggest a pseudo-crisis, since they may be only an accidental coincidence of a low point in an unsuspected irregularly oscillating temperature with the time of the regular morning or evening record. The distinction between a pseudo-crisis and such an accidental record must be somewhat arbitrary, but we have thought it less so to consider the former as occurring only when there is a coincident drop in the pulse or respirations, or where the four-hourly chart previously showed but slight variations, than to select a definite low limit of temperature as a proof of its occurrence, although recognizing that in a true crisis the fall in pulse and respirations may follow after a considerable interval. With this definition it occurred in only 32 of these cases.

The distinction between defervescence by crisis and lysis is also somewhat arbitrary, since it is difficult to draw the

line between a slow crisis and a rapid lysis, especially as some cases, which terminate abruptly, show a gradual decline before the final drop. We have reckoned those in which the temperature reached normal within 48 hours as instances of crisis, of which 424 were found. In 401 uncomplicated cases, in which the history was sufficiently complete to estimate the day of onset, the earliest date upon which crisis occurred was the second day, the latest the 19th, one case only terminating on each of these days. In one other case, which was so exceptional as to deserve special mention, the bi-daily chart, which alone was kept, showed the presence of a high temperature till the forty-sixth day, although on many occasions it fell below 99 for one observation only. On the forty-seventh it fell abruptly to normal and remained there. After the crisis resolution pursued its usual course. No complications were found. By far the largest proportion of crises occurred between the 6th and 9th days inclusive (256). It was rare before the 6th day (66 cases) and still more so after the 10th (49 cases), 30 cases had their crisis on the 10th day. Our cases give no reason for considering that there is much more likelihood of crisis occurring on the odd than on the even days, since it took place in 210 on the former to 191 on the latter, nor for crediting the old belief that the 6th is an especially critical day, the Dies Tyrannus of the ancients, since crisis occurred but 54 times on that day, while it took place 66 times on the 7th, 68 on the 8th and 68 on the 9th, nor is a comparison of the dates of death or of defervescence by lysis any more favorable. The occurrence of crisis, however, by no means always terminated the fever, for in 79 cases a slight elevation persisted for a number of days without interrupting the course of convalescence and without evident complication, though in some it was probably due to a coincident pleurisy or bronchitis. In a few instances on the day following the crisis it rose as if from a rebound even as high as 104°. Death occurred in 29 cases after crisis.

Defervescence took place by lysis in 141 cases, the temperature reaching the normal in 122, in whom the date of onset could be fixed, between the 5th and 29th days. In 83 it

occurred between the 7th and 13th days inclusive, 50 occurring from the 7th to the 10th inclusive. It occurred before the 7th day in 6, after the 13th in 33. The average day for complete defervescence in the cases of lysis was 12.37, in those with crisis 9.45, when the perturbations of temperature after crisis are reckoned in, showing that crisis shortens the course of the temperature relatively by nearly three days.

Out of 283 cases in which the history was sufficiently explicit to enable us to reckon the day of death, it occurred before the 14th in 220 (77.7 per cent.) before the 11th day in 180 (63.6 per cent.) and before the 7th in 61 (21.5 per cent.). The relative degree of safety or danger after these periods can be readily estimated. The liability of the disease to terminate one way or the other before the 14th day is shown by the fact that 72.9 per cent. of the lyses, 90.3 per cent. of the crises and 77.7 per cent. of the deaths had taken place before that day. The latest day on which death occurred was the 40th, but the extreme cases were usually complicated, as were also those in which the temperature ran a protracted course.

Of these 949 cases 341 (35.9 per cent.) died, a higher mortality rate than is given by the general statistics of the Hospital. This resulted from our method of selection, since we included all cases entering moribund and eliminated many mild ones in which a diagnosis of pneumonia was justified by the history, but which entered after the crisis and after the signs had disappeared, so that they were not valuable as statistical material either in showing the result of treatment or in illustrating special points in the history of the disease. We also eliminated a large class in which lobar pneumonia gives a notably low mortality, viz., children under 15 years. Even if the 91 moribund cases are excluded, the proportion of deaths (29.1 per cent.) still leaves much to be hoped for. Yet if one considers the sort of material furnished by the class of patients which form the great majority of those entering a municipal hospital, it is doubtful if any method of treatment will greatly reduce the rate. Lack of care during the early days of the disease, over-work, under-feeding, alcoholism and vice are ever-present factors, and a study of the

autopsies made in these cases shows a large proportion where the latter have operated to produce marked degenerative changes. Of 72 cases in which a post-mortem examination was made 46 showed the presence of one or more chronic degenerative processes sufficiently advanced to seriously impair their resisting power. The circulatory system and the kidneys were most frequently affected, but in nearly a quarter of the number there was antecedent disease of the lungs. There were three cases of severe anæmia (one pernicious) and 3 with active syphilis.

The effect of sex upon the death rate is not remarkable, the percentage of deaths among males being 36.5 while that of females was 34, nor could we determine that either the occupation of the patient or the season of the year had any appreciable influence. Age, however, as all statistics show, had a pronounced influence on prognosis, especially in the earlier and later years; we were not, however, prepared to find how constant the ratio remained between the ages of 35 and 55, as will be seen by referring to Table A, which shows a gradual increase in the rate up to the age of 35, after which it keeps fairly constant to 55, to again increase as the years grow in number until it reaches nearly 80 per cent. after 70 had been attained.

The harmful effects of the abuse of alcohol are clearly shown by our figures, for of total abstainers but 25 per cent. died, while 45.5 per cent. of the cases occurring among the hard drinkers ended fatally. The use of a moderate amount seems to have but little influence, as the proportion of deaths (26.7 per cent.) among such cases was almost the same as among the teetotalers. Delirium, which was noted as a symptom in 30 per cent. of all cases, occurred twice as often in alcoholic subjects, for it was noted 126 times (49.6 per cent.) among 256 of the former, and only 108 times (24 per cent.) among 441 of the latter. Forty-seven of the former with 30 deaths had well-marked delirium tremens. The mortality among the alcoholic cases with delirium was also greater (62.7 per cent. to 50 per cent.). There were 53 cases of delirium with 29 deaths whose habits were not stated in the records.

The amount of albuminuria, which was a very constant symptom, since it was present in 624 cases out of 799 in whom the urine was examined, appears to have considerable prognostic significance. We have not attempted to make a diagnosis of the condition of the kidneys from the report of the urinary examination because it was often impossible from the data given, but have contented ourselves with comparing the proportion of deaths with the amount of albumen, which was estimated, with sufficient accuracy for clinical purposes, by the thickness and density of the zone in the nitric acid test. Out of 175 cases in which no albumen was found 32 (18.3 per cent.) died, of 493 in which a trace or less was found 152 (30.8 per cent.) died, of 115 cases where the quantity was set down as a large trace to ⅛ per cent. 48 (41.7 per cent.) died, while of 16 cases where it exceeded the latter amount all but one died (93.3 per cent.). This shows a gradually rising ratio from 18.3 per cent. in cases without albumen to 93.3 per cent. where a large amount was present. Most, if not all, of the latter were undoubtedly cases of nephritis.

The diazo reaction was sought for in but 77 cases and was found but 4 times. Three of the positive cases were fatal, the other ran a mild course and the patient was discharged on the 10th day.

One or more leucocyte counts were made in 211 cases, and the results, so far as the influence of a leucocytosis on the prognosis goes, are quite in accord with those already published, and showed a decidedly higher mortality rate (65.5 per cent. to 30.9 per cent.) where they numbered less than 10,000. The tendency of pneumonia to an increased leucocytosis is shown by the fact that 10,000 was exceeded in all but 29 instances (13.2 per cent.). The highest number 64,000 was found in a case which had terminated in pulmonary abscess.

A daily white count was made in only a few instances, but in a considerable number it was made at intervals of a few days. Daily fluctuations were at times quite marked, but the close relationship between the drop in the temperature and fall in the number of the white cells at the crisis, to

which attention has often been called, was by no means always observed, and frequently, when it occurred, a count made a day or two later showed a return to high figures, which might persist for days, 32,500 being found in one a week after the crisis, while over 17,000 were counted two weeks or even more after that event, without recognizable complication. In some, however, a bronchitis was present, and in some resolution was delayed.

The peculiar tendency of pneumonia to recur was illustrated by 86 of our cases, the diagnosis of the previous attack being accepted on the authority of the patient in almost every instance, since only five had had previous attacks under observation in the Hospital. The highest record was 7; three was not very unusual. A tendency to attack the same lung, but not necessarily the same lobe, was suggested by a few cases where the data were complete enough to be of use. Although an attack of pneumonia may augment susceptibility to the disease it may mitigate the severity of later attacks by increasing the resisting power of the patient, for only 24 (27.9 per cent.) died, which is less than the general rate, although a higher mortality might be expected, since repeated attacks must necessarily occur in adults at advancing years.

The number of cases which are to be classed as having suffered a relapse is largely a matter of definition. In typhoid the decision is comparatively easy as the secondary rise of temperature is accompanied by a return of all or most of the distinctive features of the disease, while in pneumonia an extension of the process may be beyond the reach of our present means of physical examination. The interpretation which is put on cases with pseudo-crisis, which may closely resemble the intercurrent relapses of typhoid, will also influence the number. Its occurrence late in the course of the disease, when the true crisis may be expected, the coincident fall in the pulse and respiration, and the recognition, in a certain proportion, of an invasion of new territory increases the analogy. In our few cases a relatively small number, as in typhoid, died (7 out of 32), suggesting that a comparative immunity, or an increased resistance, was given by the

original disease. A somewhat larger proportion of deaths was observed in the cases of true relapse, 2 (25 per cent.) out of 8 dying, but the number of cases is too small to justify any conclusions. The shortest period between the two portions of the disease was less than 24 hours, the longest 5 days. The relapse more frequently began somewhat insidiously with a gradual rise of temperature for 24 to 48 hours. In one case the patient complained of chilly sensations, while one had a distinct chill. After the initial symptoms the relapse ran a fairly typical pneumonic course, though rather short, the longest continuing 10 days and terminating by crisis. In the shortest, crisis took place on the third day. In one case a well-marked pseudo-crisis occurred both in the original disease and in the relapse. On the whole the temperature in a relapse was less likely to be as high, although occasionally exceeding the first record, and the symptoms were less severe. In one of the two cases which died the second crisis had already occurred, and the temperature had remained normal for nearly 10 days, but the affected lung had not cleared up. Death so far as the records show was from exhaustion. In some cases the white count in the relapse greatly exceeded that of the original attack.

Bacteriological examinations were made in 62 of the 72 autopsies and showed the presence of the pneumococcus in 57, in 32 of which it was the only pathogenic organism present. In the others it was associated with the staphylococcus aureus 11 times, with the streptococcus 10, with both 3 times, and with Friedländer's pneumo-bacillus once. Streptococci were found alone twice and associated with the aureus once. Friedländer's bacillus was found alone once at autopsy and once in the pus aspirated from the pleural cavity. Evidence of general infection, as shown by the presence of the pneumococcus alone or combined with other bacteria in the blood or distant organs, or both, was found in 36 cases. Pus organisms alone were generally distributed in 9 cases and Friedländer's pneumo-bacillus alone in one, while in another it was associated with the pneumococcus. This general dissemination of the organisms was undoubtedly

in many cases a terminal process, but in others it was the cause of a true pneumococcus septicæmia as shown by the development of metastatic foci in other organs, which we have grouped below among the complications. No ante-mortem blood cultures were made, but clinical evidence that such a dissemination is not incompatible with recovery was given by one case, which was followed by an abscess of the hip joint and thigh, the pus from which showed the pneumococcus.

Pleurisy, being an integral part of the disease, can hardly be reckoned as a complication unless the effusion is sufficiently large to exert some influence on its course. While the presence of fluid was suspected in a considerable number of cases, in only 53 was it large enough to give absolutely distinctive signs. In 34, of whom 8 died, it was presumably serous, the diagnosis being made in many instances by the needle or at autopsy. In 4 of these cases the effusion developed in the side opposite to the pneumonic process and in 2 in both sides. In 19 it was purulent, of whom 7 died. Three of the fatal cases were associated with abscess of the lung, 2 being complicated by a fibrino-purulent pericarditis. In 2 cases aspiration alone was sufficient to complete a cure. Practically all of the cases with pleurisy which came to autopsy and in which cultures were made from the pleural cavity showed pneumococci in the exudate, whether it was fibrinous, serous or purulent.

The recognized difficulty of diagnosing pericarditis in the presence of pneumonia received a further illustration in these cases, since only about half were discovered during life, and in some of these, which were represented only by a friction rub, the inflammation may have been outside and not within the pericardial sac, yet the number which was found at autopsy shows that it is not a very rare complication, at least among the fatal cases, since it was found 8 times in 72 autopsies. Out of 19 cases, in which it was diagnosed, 11 died, in some of which it was simply an incident in a general pneumococcus septicæmia. In only 5 was there any considerable amount of fluid, and in only 3 was there sufficient to have seriously embarrassed the heart. It occurred more fre-

quently when the right lung alone was attacked, for in 10 of 18 cases in which there were complete data it was confined to that side. In greater detail the distribution of the pneumonic process in these cases was as follows: — right upper lobe alone, 3 cases; right lower lobe alone, 2 cases; left upper, 1 case; left lower, 1 case. The entire right lung was involved in 3 cases; the entire left in 1. The following combinations occurred once each: — whole left lung with right lower lobe; whole left with right middle; whole right with left lower; right upper and lower and left lower; right middle and lower; right upper and middle; both lower lobes. Acute mediastinitis was found three times at autopsy.

Phlebitis must be regarded as one of the rarer complications, since it was found in but 10 cases, 5 of whom were men. It came on late in the course of the disease, 5 to 14 days after the fall of temperature with the exception of the only fatal case, in which the affected right upper lobe suppurated, and death took place on the 14th day. The cases in which it occurred rather exceeded the average length, as in but 2 had the temperature reached normal in less than 10 days, while in one it ran 18 and in another 24 days. The left leg was the favorite site in the ratio of 6 to 3. In one case it was double. The symptoms were never severe.

Meningitis was also among the rare complications, a probable diagnosis being made in but 7 cases, although it was suspected in a number of others. The result of the autopsies in the only 3 cases in which it was permitted showed that it was to be regarded less as a complication than as one expression of a general infection, since an acute endocarditis was present in all. One of these 7 was a girl of 15 in whom cerebral symptoms appeared at the onset, and were so marked as to lead to lumbar puncture, but the withdrawal of clear sterile fluid made it probable that it was simply an instance of the meningeal type of pneumonia, especially as the temperature returned to normal on the 8th day, and recovery followed. In another, a man of 61, who died, the presence of tonic and clonic convulsions with a "risus sardonicus" made a diagnosis of tetanus with pneumonia as a complication not improbable. In 4 of the 5 cases in whom the

diagnosis seemed certain, the most noteworthy characteristic was the comparatively mild course of the pneumonic process, and the return of the temperature to normal before the development of cerebral symptoms. In one case but one normal record was made, in the others it remained within normal limits for from 1 to 4 days — one patient had even begun to sit up — and then rose in each instance to 106° or over before the fatal termination, which occurred between 36 hours and 6 days.

Peritonitis occurred in three cases, all fatal; one due to a gonorrhœal salpingitis, another coming on in the course of pneumonia. The third case was the only one in our series where there was a general infection by the pneumococcus of all the serous membranes, pleura, pericardium and peritoneum. The organism was not found in the blood, liver, spleen or kidneys.

Rheumatism and pneumonia were combined in 23 cases, of which 7 were fatal. In a majority rheumatism was the primary disease (17 out of 23), in others it was secondary, while in a few it was impossible to tell which came first, if any distinction can be made. It is possible that this list could have been much extended by a careful search through the cases of acute rheumatism, many undoubtedly being classed as complications of that disease, and lost under that general head in the index. Multiple joints were usually affected. So far as these figures go, a combination of the two conditions does not seem to increase the gravity of the prognosis of the pneumonia, the death rate not varying from the general one.

Cardiac murmurs were present in many cases during some stage of the disease, but their exact significance, whether functional or organic, was difficult to decide from the records. A few, which developed under observation and whose persistence was noted during the patient's stay in the Hospital, probably resulted from an acute endocarditis. The latter was found 9 times at autopsy, most often at the aortic valve, which was affected in 7 instances, 5 times alone and once each with the tricuspid and mitral. The mitral alone was involved twice. Eight resulted from pneumococcus in-

fection. The other was possibly dependent on a gummatous abscess of the chest wall extending into the pleura, as the pneumococcus was found only in the lungs, while the staphylococcus aureus and the streptococcus were found in the vegetations on the valve and in distant organs. Evidence of general infection was prominent in these cases, the organisms being very generally distributed. Three had meningitis, one mediastinitis and 2 abscesses and infarctions in the kidneys.

Chronic endocarditis was almost certainly present in 80 cases. We were surprised to find that its presence had exerted but little influence on the mortality as only 26 (30.2 per cent.) died, which differs little from the general rate. It was found in but 4 cases among the autopsies, in 3 of which, apart from the mechanical effect, it may have contributed to the fatal outcome by furnishing an opportunity for the growth of the acute vegetations which were present on the valves. Sixty-seven cases had mitral lesions, of whom 21 died, 9 had aortic, of whom 3 died. In 4 both aortic and mitral valves were affected with 3 deaths. The influence of muscular lesions, on the other hand, was very pronounced, for a large proportion of the cases classed as non-valvular cardiopathies died. Recovery occurred in a case with innominate aneurysm, and in another, with aneurysm of the thoracic aorta, death resulted from its rupture into the primary bronchus after the temperature had fallen by crisis.

Otitis media was recorded in 16 cases, none of which were serious. It appeared to have a tendency to run a milder course where it developed during the height of the process than when it came on during convalescence. Mastoiditis was present in one case and was suspected in another. Parotid abscess occurred twice with one death. The pneumococcus was found in neither. General neuritis developed in 3 cases, but was quite as likely to have resulted from alcoholic as from pneumonic intoxication. Purpura was present in one fatal case. Seven cases terminated in abscess or gangrene, one of which recovered after operation. Another terminated fatally in pyo-pneumothorax from rupture of the abscess into the pleura. Erysipelas occurred

three times as a late complication. As grippe was endemic during all the years in which these cases occurred, and was at times very prevalent, it was undoubtedly the antecedent disease in a considerable proportion, but in the absence of bacteriological examinations we were unable to draw any positive conclusions from the records. It is interesting to note that there were 25 cases where the middle lobe alone was involved, a rare situation except in influenza.

Evidences of tuberculosis were present clinically in 18 cases, all of whom recovered. Two of these involved the joints. At autopsy 10 others were found, nearly all of them incipient or else limited to old foci of slight extent.

As has already been stated renal disease from clinical evidence exerted a marked influence on the prognosis, and this was further exemplified by the autopsies, as 14 of them showed chronic changes in the kidneys, while in 5 the process was acute. Congestion, cloudy swelling, or other acute degeneration, was present in 31 others. Two showed abscess and infarction, the result of vegetative endocarditis.

The spleen weighed over 170 grams in 34 cases out of 65, in whom other possible causes of enlargement were eliminated, and over 250 grams in 19.

Other antecedent diseases, not already mentioned, were hepatic cirrhosis (6 cases), exophthalmic goitre (2 cases, both recovered), general paralysis, insanity, apoplexy, diabetes, chlorosis, malaria, and tertiary syphilis.

Seven of our patients were pregnant, two of whom aborted, one with fatal result. Two others ended fatally.

All patients received practically the same treatment so far as the use of alcohol and other cardiac stimulants was concerned, although the special agent and the amount given varied somewhat in the different services, so that the only useful comparison is between the results obtained in those services where the cold sponge or pack was used, as in typhoid, as a routine treatment, with those where it was either not used at all or only occasionally. This has seemed a fairer method, although less favorable for the bath treatment, than to use only those to whom baths were given, since it eliminates the possibility of the cases being selected.

Omitting the moribund cases, where any form of treatment would have been unavailing, there were 139 treated by baths, as routine, with 43 deaths, while 207 of the other 709 cases died, which shows a slight percentage (1.7) against the baths. This is in line with the conclusion, that pneumonia is uninfluenced by treatment, drawn by Coolidge and Townsend from all the cases of the disease, 1,000 in number, which had entered the Massachusetts General Hospital up to 1889.

II.

A SYNOPSIS OF A THREE MONTHS' SERVICE IN THE GYNAECOLOGICAL DEPARTMENT.

BY CHARLES M. GREEN, M.D., AND FRANK A. HIGGINS, M.D.

SINCE the enlargement and refitting of the accommodations for this department in 1898–99, the service has been enabled to perform much more satisfactorily the three great functions of all public hospitals — the care of the sick, the advancement of knowledge, and the teaching of medical students.

During the months of October, November, and December, 1899, there were 140 patients under our care — a smaller number than in subsequent quarters, owing to the fact that during this quarter a portion of our beds were needed for medical cases in another service. Of these 140 cases, five died, viz.: —

Epidermoid cancer of clitoris, infiltration of inguinal glands, general sepsis	1
Icterus neonatorum	1
Premature birth	1
Ruptured extra-uterine pregnancy (no operation)	1
Septicaemia following abortion	1
	5

For convenience of analysis the cases are divided into the following groups: —

Pelvic inflammation, treated without operation	23
Pelvic inflammation, pelvic tumor, or other conditions, treated by abdominal section	25
Abortion or miscarriage	22
Miscellaneous cases	70
	140

MISCELLANEOUS CASES.

The cases included under this head embrace a wide variety of pathological conditions, and may be said to represent very well the class of cases seen by the general practitioner in his daily work. Although many of these cases were simple, and for the most part called for only minor treatment, they were of great value in the training of the house staff, and in the teaching of students. The cases are classified as follows :—

Abscess of vulvo-vaginal glands	2	
Contusion of vulva	1	
Cyst of labium majus	1	
Haematoma of labium majus	1	
Epidermoid cancer of clitoris	1	
Gonorrhœa of urethra	1	
		7
Cancer of vagina, recurrent 6 years after hysterectomy	1	
Cystocele and rectocele	1	
Traumatic erosion of vagina	1	
Rupture of perineum, complete	1	
Rupture of perineum, incomplete	5	
		9
Cancer of uterus	1	
Endometritis	5	
Fibroid polypus of uterus	3	
Rupture of uterus	1	
Anteflexion of uterus, with dysmenorrhœa	6	
Prolapse of uterus, with cystocele and rectocele	1	
Retroversion of uterus	5	
Laceration of cervix uteri	9	
Infantile uterus	1	
Metrorrhagia	1	
		33
Pregnancy, with laceration of cervix uteri	1	
Pregnancy, with intercurrent typhoid fever	1	
Pregnancy, extra-uterine, after rupture	1	
Labor, in a patient with typhoid	1	
Labor, spontaneous, at seven months	1	
Labor, complicated with placenta praevia	1	
Puerperium	2	
Puerperal septicaemia	1	
Infancy	4	
		13
Carried forward		62

Brought forward		62
Alcoholism	1	
Constipation	1	
Intra-abdominal malignant diseases, with ascites	1	
Mental disease	1	
Neurasthenia	3	
Pelvic congestion	1	
	—	8
Total		70

On 36 of the above group of miscellaneous cases, 43 operations were performed, viz.: —

Amputation of cervix uteri	1
Curettage of uterus	12
Dilatation of cervix uteri, with use of glass stem pessary,	5
Excision of clitoris and inguinal glands	1
Excision of fibroid polypus of uterus	3
Excision of labial cyst	1
Incision of vulvo-vaginal abscess	2
Incision of vulvo-vaginal haematoma	1
Internal podalic version, for placenta praevia	1
Low forceps delivery	1
Paracentesis of abdomen	1
Perineorraphy (1 for complete, 5 for incomplete, rupture),	6
Trachelorraphy	8
Total	43

All of these operations resulted successfully with the exception of that performed for extirpation of cancer of the clitoris. There was extensive infiltration of the inguinal glands, and they were excised: the patient died of general sepsis. The case of intra-abdominal malignant disease suffered chiefly from embarrassed respiration, and from complete prolapse of the uterus and vagina, due to an extreme degree of ascites: after tapping, the patient was discharged, relieved of urgent symptoms.

Of the 34 non-operative cases in the miscellaneous group, three died: — two infants, one of icterus, and one of prematurity; and a case of ruptured tubal pregnancy. This latter case entered the hospital after the morning visit, and through a series of unfortunate misunderstandings was not seen by either of us until midnight, when the patient was moribund. The case of ruptured uterus was one of marked interest.

The patient was delivered with forceps outside the hospital, and was found on admission to have sustained extensive rupture of the lower segment. Fortunately the peritoneum was not torn through, and there was no prolapse of omentum or of intestine. For local treatment the patient received only irrigation, usually with normal salt solution, and two or three times with weak antiseptics: she made a complete recovery.

ABORTIONS OR MISCARRIAGES.

It is always a cause of regret to this department that so many of its beds must be taken up by cases of abortion. While a few of the cases are of innocent or inevitable origin, very many of them come to the hospital from the abortionist, or after successful attempts by their own deeds. Some cases enter already septic; some simply occupy a bed while making a normal convalescence. The hospital is obliged to care for all cases alike, whatever the cause of the abortion, since it is obviously impossible to discriminate between the criminal, the innocent, and the ignorant; moreover, whatever the cause of the abortion, cases often apply for admission with such urgent symptoms that they cannot be refused. Many of the cases have no especial interest to an experienced physician; but they are of value for purposes of teaching.

Of the 22 cases in this group, one entered after an attempted abortion, and was discharged, after minor treatment, without interruption of the pregnancy. One case entered profoundly septic, and died of general infection, in spite of treatment. The other twenty cases all recovered. Curettage of the uterus was performed in 11 cases.

PELVIC INFLAMMATION TREATED WITHOUT OPERATION.

The general principle on which we deal with cases of pelvic inflammation, which enter, as a rule, with pelvic pain and tenderness, more or less febrile action, and various functional disturbances, is to place them under rigid observation, while treatment is directed to the relief of urgent symptoms. Even in very acute cases, we have found that with an occasional exception, which demands prompt surgical treatment,

the acute symptoms ameliorate under rest and palliative measures, the pelvic suppurative process becomes walled off from the general peritoneum by plastic exudate, and subsequent observation and careful study of symptoms can then determine whether operation is necessary, or whether, after symptomatic recovery, the patient may safely be discharged with a reasonable prospect of immunity from an exacerbation of the inflammatory process and a recurrence of symptoms.

As is now well known the nature of the infection, when this can be ascertained, exerts an important influence on the decision in favor of, or against, operation. The pelvic ravages of the gonococcus are rarely recovered from; and the unfortunate victim must generally choose between the extirpation of her uterine appendages and a life of invalidism. With the septic infections attendant on abortion and labor, on the other hand, the case is different. Many of these patients not only recover symplomatically, but function is so far restored that child-bearing is again possible. Of course, this latter possibility is largely due to the fact that in the septic infections it is often the case that only one of the fallopian tubes is involved; whereas with the gonorrhœal infection the destructive process is more commonly bi-lateral. In doubtful cases, when the nature of the infection is not evident, and indeed in all cases, except occasionally the very acute that do not soon improve under observation, but show signs of beginning infection of the general peritoneum, experience has taught us that it is the part of wise conservatism not to resort to surgical measures until time has shown whether health, even if not function, cannot be restored without them.

Of the 23 cases in this group, one was under observation only four days, and three remained after our term to complete their convalescence; nineteen were discharged relieved of symptoms, with instructions to return for operation or for further palliative treatment, if symptoms recur.

The therapeutic measures employed in these cases, in addition to indicated general medication, were rest in bed, hot fomentations to the hypogastrium, hot vaginal douches, pelvic depletion with glycerine, and sometimes ichthyol, together with moderate catharsis and attention to the functions

of the skin and kidneys. In the very acute cases the use of ice over the hypogastrium has generally proved more efficacious than hot applications. Ice affords relief from pain, appears to diminish pelvic congestion, and apparently aids in checking the inflammatory process. In conjunction with the judicious use of saline cathartics, ice has certainly arrested many cases of threatening peritonitis.

These cases are of great value and interest to a clinic. They call for the wisest judgment, and most conscientious care on the part of the attending staff; and they are invaluable in training the student's touch, and powers of observation.

PELVIC INFLAMMATION, PELVIC TUMOR, OR OTHER CONDITIONS, TREATED BY ABDOMINAL SECTION.

This group embraces those cases in which, after adequate observation, and after reasonable attempts to relieve symptoms by palliative measures had failed, resort to surgery seemed advisable. Except when urgent symptoms made early operation necessary, time enough was taken for the general preparation of the patient. A rested body, restored function of skin, bowels, kidney, and stomach, and a nervous system in stable equilibrium are important factors of success in abdominal surgery. The conditions demanding operation are shown in the following table of pathological diagnoses: —

Retroflexion of uterus		2
Fibro-myoma of uterus	1	
Myoma of uterus, with chronic peri-salpingitis and peri-oöphoritis	1	
Myoma of uterus, with telangiectasis of lymph vessels	1	
Myoma of uterus, with degeneration	1	
Myoma of uterus, multiple	1	
	—	5
Ovarian cyst, simple	1	
Ovarian cyst, dermoid	1	
Ovarian cyst, follicular, with parovarian cyst	2	
	—	4
Renal cyst		1
Acute purulent salpingitis (gonorrhœal) with beginning general peritonitis	1	
	—	—
Carried forward	1	12

Brought forward	1	12
Acute salpingitis, with follicular cysts of ovary and parovarian cyst	1	
Acute and chronic salpingitis	2	
Acute and chronic salpingitis, with parovarian cyst	1	
Chronic salpingitis	1	
Chronic salpingitis, with follicular cysts of ovary	1	
Chronc salpingitis, with follicular cysts of ovary and parovarian cyst	1	
Chronic salpingitis, with peri-oöphoritis	1	
Chronic peri-salpingitis, with follicular cysts of ovary	1	
Chronic peri-salpingitis and peri-oöphoritis	1	
Chronic peri-salpingitis and peri-oöphoritis, with parovarian cyst	1	
Tubercular salpingitis	1	
	—	13
Total		25

In the case of renal cyst the abdomen was opened under an erroneous diagnosis of ovarian or parovarian cyst. After intra-abdominal examination the incision was closed, and on recovery the patient was transferred to one of the surgical services, where she was afterwards operated on through a lumbar incision. On the remaining 24 patients operations were performed as follows: —

Excision of dermoid cyst of ovary	1	
Excision of parovarian cyst	6	
	—	7
Hysterectomy, complete	1	
Hysterectomy, supra-vaginal	4	
	—	5
Incision and drainage of tubercular tubal abscess		1
Resection of ovary		1
Salpingo-oöphorectomy, uni-lateral	3	
Salpingo-oöphorectomy, bi-lateral	19	
Salpingectomy bi-lateral and oöphorectomy uni-lateral	1	
	—	23
Ventro-suspension or fixation of uterus		15
Total		52

There was no death among this group of abdominal cases; and all were discharged well, or relieved of the symptoms for which operation was performed.

Drainage was employed in only two cases: once in the case of tubercular salpingitis; once to control venous oozing. In

five cases catgut was used in the peritoneal cavity; in all other cases, silk. In nearly all cases, and always when possible, raw surfaces were covered with peritoneum by continuous suture. Including the two cases wherein the abdomen was opened for the sole purpose of suspending the retro-flexed uterus, ventral suspension or fixation was performed fifteen times: it was our purpose always to suspend the uterus, when by the removal of appendages the broad ligaments were so far impaired as to deprive the uterus of support. The uterus was never permanently fixed to the abdominal wall when either ovary was left: whenever pregnancy was possible, the suspending sutures included only peritoneum and one or two muscular fibres, in order that gradually a suspensory ligament might be developed, and the uterus be free to rise into the abdominal cavity. Moreover, in all such cases, the suspending sutures were passed just anterior to the fundus. To be sure, the uterus is not thus placed in a perfectly normal axis; but in the event of pregnancy we believe there is less risk of obstetric difficulties than when the uterus is suspended from its posterior surface. In nearly all cases, after cleansing of the abdominal cavity, it was filled with hot normal salt solution before closing the lower angle of the incision. This, not only for the purposes of systemic stimulation, but in the belief that the danger of intestinal adhesions is thereby minimized, and because thirst is less imperative in the first twenty-four hours of convalescence when the system is thus freely supplied with liquid. In twenty cases the incision was closed with interrupted, mass sutures of silkworm gut: in one case in layers with silk sutures; and in four cases in layers with catgut.

The symptomotology of this group of abdominal cases, the indications for operation, the history of convalescence, and results are given in the following concise extracts from the hospital records: —

1. DERMOID CYST OF OVARY.

A. G., 23, single. Five days before entrance began to have sharp, cutting pain in right groin after lifting a heavy weight. Pain has been quite constant since then, and shoots down right thigh.

T. 100.6° on entrance. Cervix high in plevis, fundus not felt. A large, tender mass behind uterus, thought to be inflammatory. Symptomatic improvement under rest and local treatment; but as there was no change in the pelvic mass after six weeks of observation, operation was thought advisable.

Operation. The abdomen was opened in the expectation of finding bi-lateral, tubo-ovarian, inflammatory masses; but inspection revealed a large, dark colored, cystic tumor behind the uterus and left broad ligament, with recent adhesions; both appendages were adherent to the cyst. In removing the cyst it was found necessary to remove also the appendages. Ventro-suspension of uterus. "Size of cyst, 8 x 6 x 4 cm. Outer surface dark red in color, showing evidences of adhesions. Surface somewhat nodular from the presence of smaller cysts. Cyst wall averages 0.5 cm. in thickness. Cyst contains soft, reddish material, with hair; bone 6.5 x 1.5 x 1 cm., projecting from which are four well-formed teeth resembling molars, and two small bony nodules; also about ½ oz. yellowish, fatty material. The hair grows in a tuft from the surface of the wall, just above attachment of jaw. Coverslip shows much fat, small amount of detritus, no cholesterin crystals. At one side of the cyst is the oviduct, 6 cm. long and 0.8 cm. across. The other oviduct is 8 cm. long, and normal in appearance; the other ovary 3 x 3 x 1 cm., and containing many small serous cysts."

Convalescence normal: highest T 99.8° on evening of third day. Discharged well on the 28th day: uterus in normal position, no pelvic exudate, abdominal scar firm.

2. RETROFLEXION OF UTERUS.

A. B., 28, married, ii para. For five years has suffered with constant backache, dull pain in left groin, and painful defecation. Has been treated in O. P. D. for nine months without permanent benefit, and is advised to enter for operation.

Operation. Uterus found retroflexed, and held by a few adhesions, which are easily separated; appendages apparently normal. Ventro-suspension with two silk sutures. Incision closed in layers with silk.

Convalescence normal. Discharged well on the 28th day, with the uterus in normal position, and with an apparently normal abdominal cicatrix. [Later a sinus developed, and in May, 1901, reëntered for closure of the same. Probe passed as far as fundus uteri, which was still attached to anterior abdominal wall. Sinus enlarged sufficiently, walls excised, two knots of silk removed with curette. Cavity cleansed and packed with iodoform gauze: sinus closed in two weeks.]

3. RETROFLEXION OF UTERUS.

H. N., 24, single. Enters from O. P. D. for operation on a retroflexed uterus, which has not been relieved by two years of minor treatment.

Operation. Uterus found sharply retroflexed and non-adherent: musculature very flabby. Appendages inspected and found normal. Suspension with two silk sutures.

Convalescence. On 21st day developed a small sinus, which discharged slightly, but was shallow. A week later, up and about the ward, with no subjective symptoms. Sinus gradually closed, and patient discharged well, except for weakness due to attack of tonsillitis in latter days in hospital.

4. FIBRO-MYOMA UTERI.

M. H., 31, married 10 years, iii para. In hospital earlier in year for dysmenorrhœa, metrorrhagia, and abdominal pain, and found to have an interstitial fibroid. After treatment, was discharged relieved of symptoms, in hope that tumor might become submucous or pedunculate, when it could be removed without sacrificing the uterus. But pain and hæmorrhage recurred, and patient returned for operation.

Operation. Uterus size of four months pregnancy. Tumor involved cervix to such a degree that it was necessary to do complete hysterectomy. Appendages also removed. Vaginal vault closed with fine silk, and covered over with peritoneum.

Convalescence uneventful, except for an attack of pleurisy beginning on 18th day. Discharged well on 31st day: abdominal scar satisfactory; vaginal cicatrix smooth and linear, except at left angle, where there is a pea-shaped nodule where edges were turned in.

5. MYOMA UTERI, WITH MUCH DEGENERATION.

M. O. N., 45, single. Six years ago noticed the presence of an abdominal tumor, and began to have severe pain in back and head. During these years has had persistent constipation, and dull abdominal pain. Examination revealed a tumor occupying the hypogastrium, and extending nearly to umbilicus, — apparently a fibroid uterus.

Operation. Tumor non-adherent. Supra-vaginal hysterectomy, with removal of appendages. Cervical stump and broad ligaments covered in with peritoneum.

Convalescence uninterrupted; highest T 100° on evening of 3d day. Discharged well on 27th day.

6. MYOMA UTERI, TELANGIECTASIS OF LYMPH VESSELS.

M. C., 36, single. For past six years has suffered more or less pain in small of back and lower abdomen, especially on right. Constant feeling of weight in pelvis when on her feet. Advised to have operation three years ago ; since then has gradually become incapacitated for work. Tumor nearly reached umbilicus, and well out of pelvis.

Operation. Left ovary enlarged and cystic ; right appendages adherent, and separated with difficulty. Supra-vaginal hysterectomy, removal of appendages. Cervical stump and broad ligaments closed over with peritoneum. Weight of tumor 1,180 grms., 12 x 10 x 10 cm.

Convalescence. Disturbed by slight phlebitis and swelling of both legs. Discharged well on 36th day, with a satisfactory abdominal scar. [Seen some months later, patient found to be neurasthenic and mentally depressed, but with no pelvic symptoms.]

7. MULTIPLE MYOMA UTERI.

M. H., 29, single. Has always had dysmenorrhœa, and for three years menorrhagia. For past six months severe backache, and feeling of weight in pelvis. Uterus irregular in outline, and enlarged ; a mass on right anterior surface, another on left, and many smaller masses felt by vagina in lower segment. With moderate pressure tumor could be lifted out of pelvis.

Operation. Tumor non-adherent. Supra-vaginal hysterectomy. Fibroid nodule in posterior cervical lip enucleated. Appendages removed with uterus. Cervical stump and broad ligaments covered with peritoneum. Blood loss slight. Weight of tumor 1,040 grms. 11 x 9 x 7 cm. Both ovaries show many small follicular cysts.

Convalescence. Suffered much with nausea and vomiting after eating ; finally relieved by washing out stomach and by rectal feeding. Moderate phlebitis of right femoral. Incision healed by first intention. Discharged well on 48th day.

8. MYOMA UTERI, CHRONIC PERI-SALPINGITIS AND PERI-OÖPHORITIS.

V. J., 31, single. Induced abortion at three months seven years ago. For two years has had dull abdominal pain, backache, and bearing down. Two months ago pain became severe in left iliac region. Cervix small and placed just behind the symphysis pubis. A mass filling half the pelvis, studded with smaller masses : probably an enlarged, retroverted uterus with multiple fibroids. Operation advised from history and symptoms.

Operation. Left ovary cystic ; right appendages displaced behind the uterus, and adherent to it. Uterus retroverted and studded with

fibroid masses, principally on right and posterior surfaces. Myomectomy considered ; but hysterectomy seemed advisable in view of condition of appendages. Supra-vaginal hysterectomy, bi-lateral salpingo-oöphorectomy ; cervical stump and broad ligaments closed over with peritoneum.

Convalescence uneventful. Discharged well on 41st day.

9. SIMPLE CYST OF OVARY.

C. P., 40, married, v para. For five years severe backache, pain in lower abdomen especially on right side, feeling of weight in pelvis. Appendages prolapsed and tender ; both ovaries enlarged. After observation and palliative treatment, operation advised.

Operation. Cyst of left ovary, with several thin-walled cysts attached ; tube somewhat thickened, and held by moderate adhesions : left salpingo-oöphorectomy, cyst ruptured in removal. Right tube normal ; right ovary contained a cyst size of a marble : cyst removed without rupture, and ovary closed in with silk. Ventro-suspension. Troublesome venous oozing on left made gauze pressure drain advisable.

Convalescence. Drain removed on 3d day, and provisional sutures tied : all bleeding had been controlled. Sinus kept patient in hospital 11 weeks. On discharge, uterus held in suspension, sinus closed to within $\frac{1}{4}$ inch. Discharged symptomatically well, and seen later, outside hospital, sinus found closed, and patient well.

10. PAROVARIAN CYST, FOLLICULAR CYSTS OF OVARY.

N. L., 33, single. Had been in hospital nine months previously, suffering from menorrhagia and anaemia. After discharge in April had amenorrhœa until August, when she flowed several days, then amenorrhœa until October. For past two weeks considerable flowing, constant bearing down pain, severe backache. Uterus found displaced to right by an apparent cyst of left ovary. In view of history and symptoms, after observation, operation advised.

Operation. Left ovary found enlarged to size of hen's egg, and involved in a uni-locular parovarian cyst ; tube healthy. Right ovary cystic and enlarged to twice its normal size. Bi-lateral salpingo-oöphorectomy, ventro-fixation.

Convalescence. Incision closed by first intention. T. reached 101.2° on evening of 2d day, but was normal by 8th day. On 30th day, uterus fixed to anterior abdominal wall, nothing felt in either broad ligament. No symptoms but weakness : discharged to Convalescent Home.

11. PAROVARIAN CYST, FOLLICULAR CYSTS OF OVARY.

M. A., 30, married five years, iv para. For nine years has had more or less constant backache, dull pain in lower abdomen, in both

groins, more especially in the left. Uterus low in pelvis, in first degree of retroversion; tender mass in left broad ligament, of hen's-egg size, probably tubo-ovarian. In view of long period of suffering and disability, operation advised.

Operation. Fimbriæ of right tube found adherent, and freed; right ovary normal. On left, follicular cysts of ovary, and a paro-varian cyst: left salpingo-oöphorectomy with removal of cyst. Ventro-suspension.

Convalescence uninterrupted; highest T. 100°. Discharged well on 27th day.

12. ACUTE GONORRHŒAL SALPINGITIS, BEGINNING GENERAL PERITONITIS.

S. C., 19, single, table-girl. Had a criminal abortion nine months previously, and for past five months metrorrhagia. A month ago began to have pain in lower abdomen, which has gradually grown more severe, and is worse on left side. Pain sharp and cutting at times. Has had chills, fever, and vomiting. Enters with T. 100.8°. Uterus drawn slightly backwards, slight resistance over left broad ligament. No diagnosis made at the time; but within three days patient developed a typical case of acute salpingitis with symptoms of beginning general peritonitis. Examination under ether revealed a small mass high in right broad ligament. P. reached 120, T. 102.2°, and there were tenderness, pain, and vomiting.

Operation. On opening abdomen beginning peritonitis was evident: there were recent intestinal adhesions, with exudate on both sides of pelvis; considerable gray, flocculent material on bowels and omentum. Both tubes enlarged, dark purple in color, and adherent to ovaries and intestines: purulent discharge from fimbriæ of both tubes. Both tubes and the right ovary removed: left ovary essentially normal, and allowed to remain. Gonococcus found.

Convalescence. Highest T. 102.2° on evening of 1st day, gradually dropping to normal on 9th day. Discharged well on 30th day.

13. ACUTE SALPINGITIS, FOLLICULAR CYSTS OF OVARY, PARO-VARIAN CYST.

J. B., 20, single, shop-girl. Had a full-term labor five years ago, and an induced abortion four years later. Tear of cervix and perineum at labor, since then considerable pain in back and abdomen. Profuse vaginal discharge for a year. Uterus prolapsed, retroverted, and retroflexed; indefinite mass in left broad ligament. Later, under ether, hen's-egg mass on right, — a cystic ovary or a hydrosalpinx. Uterus curetted. After a month of observation and minor treatment, abdominal section advised on account of continued pain.

Operation. On right, a parovarian cyst, 2 x 4 inches, and a cyst of ovary size of hen's egg. Left tube and ovary prolapsed and adherent; ovary twice its normal size, and containing a blood cyst; tube containing pus. Bi-lateral salpingo-oöphorectomy, removal of parovarian cyst, ventro-fixation of uterus.

Convalescence. For several days patient restless, with mental aberration, and required restraint; on 5th day T. reached 102° during menstruation, gradually reaching normal on 12th day. From this time convalescence progressed satisfactorily, and patient was sitting up in bed, when she developed a pleurisy with effusion, with a probable pneumonic process, which kept her in hospital until eight weeks after operation. Discharged well: uterus in good position, broad ligaments clear, no pelvic exudate.

14. ACUTE AND CHRONIC SALPINGITIS.

J. M., 18, married 2 years, i para. Since childbed fever a year ago, has had attacks of pain and soreness in both groins: two weeks ago, an acute exacerbation, with nausea, vomiting, and fever. Uterus retroverted: behind it a mass probably resulting from septic puerperal infection a year before. Operation advised.

Operation. Uterus densely adherent to masses behind it and to the rectum. Tubo-ovarian abscess and a small cyst on left side, extending around to back of uterus. On right, a similar, smaller mass. Bi-lateral salpingo-oöphorectomy, ventro-fixation with catgut.

Convalescence. There was a small, stitch sinus, which closed by granulation. Discharged on 32d day with a good scar, but with a slight induration and tenderness in Douglas' fossa.

15. ACUTE AND CHRONIC SALPINGITIS.

F. H., 21, single, stenographer. Pelvic inflammation two years ago; since then frequent attacks of pelvic pain and backache; chills the past few days; enters with P. 90, T. 100°. Very tender bi-lateral masses; uterus not movable. Under observation seemed fairly comfortable in daytime, but had considerable pain at night, when T. reached 102°–103°, and P. 115–120. With ice and other palliative measures patient improved, and had a normal T. on 5th day; but after a fortnight's observation operation was decided on.

Operation. Both tubes enlarged and thickened: right tube prolapsed, adherent to bowel, and to an abscess cavity low in the pelvis; left tube curved around, and adherent to anterior surface of broad ligament, whence it twisted back of the uterus to pus cavity above mentioned, which contained 2 oz. of pus. Ovaries cystic. Omentum and bowels adherent to the uterus. Bi-lateral salpingo-oöphorectomy.

Convalescence. On 18th day, chill in evening, T. 102°–103°; slight abdominal pain, and evidently some inflammatory process behind the

uterus, which, however, subsided, and patient was discharged on 47th day with no tenderness, no pain, and no pelvic thickening.

16. ACUTE AND CHRONIC SALPINGITIS, PAROVARIAN CYST.

M. Y., 30, married 14 years, iv para. For seven years constant dull pain in small of back and across lower abdomen, especially on left; pain at times very severe. Menorrhagia, dysmenorrhœa. Uterus retro-posed, adherent in a mass of exudate. On right, a fluctuant tumor, probably a cyst. Left appendages not differentiated. Operation recommended after three weeks of observation and preparation.

Operation. A large cyst of right broad ligament with small ovary adherent; left tube thickened, and contained old pus. Bi-lateral salpingo-oöphorectomy, removal of cyst, ventro-fixation.

Convalescence uneventful; discharged well on 27th day. Uterus firmly attached to anterior abdominal wall, no pelvic exudate, incision healed by first intention.

17. CHRONIC SALPINGITIS.

L. F. B., 28, married 9 years, vi para. Chronic bi-lateral salpingitis of probable puerperal origin. Operation advised on account of pain and invalidism.

Operation. Bi-lateral salpingo-oöphorectomy, ventro-fixation. A pus cavity deep in the pelvis was accidentally ruptured in removal.

Convalescence. Stitches removed on 9th day, apparently good union; but six days later, thick pus, of foul, fæcal odor, was found to issue from a sinus at lower angle of incision. This pus was found to contain streptococcus pyogenes and bacillus coli communis. Five days later, however, the pathologist reported "no bacillus coli communis, and no organisms indicating fæcal origin." Patient kept in hospital 45 days after operation, when there remained but a very small, shallow sinus, too superficial for a wick, and she was discharged feeling perfectly well. [Seen in November, 1900, patient was entirely free from symptoms. Uterus remained fixed to anterior abdominal wall. A small sinus at site of uterine fixation, from which escaped occasionally a few drops of pus. In May, 1901, patient reëntered our service for closure of the sinus: it was dissected out, and ultimately closed.]

18. CHRONIC SALPINGITIS, SIMPLE FOLLICULAR CYSTS OF OVARY.

J. McC., 28, married 9 years, one abortion at 3 months in 1890. Ever since abortion has had considerable backache, and abdomino-pelvic pain, of late worse on right side, and of a sharp, cutting character. Metrorrhagia for past year. Catamenia regular, but profuse and painful. Uterus of normal size and position, only par-

tially movable. Tubo-ovarian masses, apparently inflammatory, on both sides and behind uterus. After nearly three weeks of observation and treatment the acute symptoms subsided; but the pelvic masses were unchanged, and in view of the history and probable etiology operation was advised.

Operation. Bi-lateral tubo-ovarian masses were found, low in the pelvis, adherent to posterior surface of uterus and broad ligaments; both ovaries cystic, tube walls much thickened. Bi-lateral salpingo-oöphorectomy, ventro-suspension.

Convalescence. Highest T. 100.2° on evening of 12th day. On 18th day a shallow stitch sinus was noted at upper end of incision, which kept patient in hospital until the 6th week. On discharge, sinus nearly healed by granulation; uterus forward; no pelvic tenderness; slight thickening in left broad ligament close to the uterus.

19. CHRONIC SALPINGITIS, FOLLICULAR CYSTS OF OVARY, PAROVARIAN CYST.

C. R., 29, married 12 years, one child in 1894. Was in this service in 1897 with a pelvic inflammation; received palliative minor treatment, and was discharged symptomatically well. Remained quite well for a year, when she began to have bearing down sensations in pelvis, with pain in back and in left groin. Pain has been more or less constant, at times sharp, and worse when reclining. Uterus tender, cervix lacerated; behind and to left of uterus, a tender mass. Patient improved symptomatically under rest and local treatment; but after 10 days of observation, operation was advised in view of the history and symptoms.

Operation. Appendages on left prolapsed behind uterus and firmly adherent; marked venous engorgement in left broad ligament; tube enlarged; ovary cystic. On the right, ovary enlarged and cystic; fimbriæ merged in a cyst the size of a pigeon's egg. Bi-lateral salpingo-oöphorectomy; venous oozing from separation of adhesions from posterior uterine wall controlled with fine silk sutures.

Convalescence. Highest T. 100.2° on evening of first day; some faintness and nausea for first 10 days. Discharged well and in good general health in four weeks; uterus in good position; no exudate in pelvis; scar satisfactory.

20. CHRONIC SALPINGITIS, PERI-OÖPHORITIS.

M. M., 21, single, table-girl. One month before entrance had considerable vaginal discharge, and frequent and painful micturition; soon after "caught cold" during menstruation, and flow ceased. Began to have pain, of sharp and intermittent character, in left inguinal region. Entered with P. 100, T. 101.4°. Uterus somewhat enlarged, and pushed to right by a mass behind and to the left.

Gonococcus found in urethral smear. Under use of protargol and other local measures, patient improved, and T. dropped to normal; but since the pelvic mass showed no diminution after three weeks, and in view of the apparent infection, operation was advised.

Operation. Many recent adhesions of omentum and bowels, separated with much difficulty: at one point the gut was so bound to the uterus that a V-shaped piece was excised from the womb. Left appendages prolapsed and densely adherent to rectum: tube considerably thickened, and gave evidence of an interstitial process; on this side patient had had most pain. On the right was a tubo-ovarian abscess. Bi-lateral salpingo-oöphorectomy.

Convalescence. Highest T. 99.8° on evening of 2d day, normal after 4th day. Discharged well on 29th day: cervix central, uterus in normal position, slight thickening at base of left broad ligament (old exudate), scar satisfactory.

21. CHRONIC PERI-SALPINGITIS, SIMPLE FOLLICULAR CYSTS OF OVARY.

G. E., 29, single. "Womb trouble" for four years. Two years ago had curettage for flowing. For several years dull pain in lower abdomen, quite constant, and more severe on left side. Pain worse during catamenia. Constant backache, headache, anaemia. Uterus low and not freely movable; cystic masses in both broad ligaments; P. and T. normal. With rest in bed and general care for three weeks, symptomatic improvement; but in view of the long continued pelvic pain and disability, and at patient's urgent desire, operation was decided on.

Operation. Left tube and ovary prolapsed, and bound to intestines with adhesions so dense that they had to be cut; ovary enlarged; tube distended, fimbriæ adherent to ovary. Right ovary cystic, larger than the left, and bound to posterior wall of uterus with adhesions dense enough for the use of scissors to separate them; tube enlarged, fimbriæ obliterated by firm adhesions to ovary. Bilateral salpingo-oöphorectomy, ventro-suspension.

Convalescence normal. Febrile only at time of catamenia, when T. rose to 100.4°. Discharged well after four weeks. Uterus in normal position, no exudate in pelvis, no bulging of abdominal scar.

22. CHRONIC PERI-SALPINGITIS, PERI-OÖPHORITIS.

F. P., 30, married 11 years, ii para. Had had right salpingo-oöphorectomy, performed by another member of the staff, seven months previously. Reëntered with symptoms pointing to salpingo-oöphoritis on the left side: operation seemed advisable.

Operation. At the previous operation the uterus had been suspended; and on opening the abdomen the uterus was found held in

position by a ligament ¼-inch thick and ¾-inch long. On the right, whence the appendages had been removed, was a good cicatrix along the broad ligament; but a coil of intestine was adherent to the posterior surface near the uterus. On the left was a tubo-ovarian mass, which was removed.

Convalescence retarded by two stitch sinuses, which, however, ultimately closed. Highest T. 100° on evening of 2d day; and it was normal after 6th day. On discharge patient was well as far as pelvic conditions were concerned, her only symptom being weakness.

23. CHRONIC PERI-SALPINGITIS AND PERI-OÖPHORITIS, PAROVARIAN CYST.

E. L., 32, married 7 years. One abortion at 3 months 6 years ago, followed by pelvic inflammation. Since then, recurring exacerbations with fever and pain. Mass on the right that seemed like a cyst, pushing uterus to the left; appendages not differentiated. Operation advised from the long standing symptoms.

Operation. Large parovarian cyst filling right side of pelvis; tubo-ovarian mass on left, evidently the seat of an old tubal abscess. Bi-lateral salpingo-oöphorectomy and excision of parovarian cyst. Operation difficult from extensive adhesions, distortion of parts, and varicose veins running over the large cyst wall. Ventro-suspension.

Convalescence complicated with pleurisy and pneumonia two weeks after operation. Discharged well on the 40th day, with uterus in good position, and nothing abnormal felt in pelvis.

24. TUBERCULAR SALPINGITIS.

E. R., 19, single. For 3 weeks has had sharp, cutting pain in lower abdomen, radiating around to back; chilly and feverish of late. For a month, profuse vaginal discharge and painful micturition. Uterus fixed, with hard, boardy resistance behind; both appendages probably involved in the mass. After a month of observation and treatment, operation was advised.

Operation. Extensive adhesions. Peritoneum thickened, and adherent to mesentery and an adventitious mass. In an effort to separate adhesions the finger entered a pus cavity, which after being drained proved to be the size of a hen's egg. Broad ligaments partially explored, and no other pus cavity found. Uterus apparently below the pus cavity. Owing to the extremely dense adhesions it seemed best not to try to remove the abscess sac. The pus had a strong, fæcal odor; but no communication with intestine was found. Pus cavity cleansed, and abdomen closed with gauze drainage.

Convalescence. Patient much relieved by operation, and had little or no pain thereafter. Pus cavity gradually shrank under irrigation

and drainage; and after 82 days patient was discharged in good general health and free from symptoms, but with a small sinus. The uterus fixed in normal axis, and there was a general induration behind it.

[After discharge in March, 1900, patient remained in good general health, and in February, 1901, she married. The sinus continued to discharge pus, at times tinged with blood. In May, 1901, she reëntered our service in the hope of having the sinus closed. Sinus found to be 1½ inches deep, and more or less obstructed by granulation tissue. Under ether sinus sufficiently dilated and curetted, cleansed, and packed with iodoform gauze. Packing renewed daily, and after 8 days there was no purulent discharge: 10 days later sinus was small and only ¾ inch deep. Four weeks from entrance sinus was so nearly closed that patient was discharged, in excellent general health, for continued observation in the O. P. D.]

III.

THE SCOPE OF VAGINAL SECTION IN THE TREATMENT OF PUS IN THE PELVIS, WITH A REPORT OF EIGHTY-TWO ABDOMINAL SECTIONS WITHOUT MORTALITY; AND EIGHTEEN VAGINAL SECTIONS WITH ONE DEATH, DUE TO ACCIDENTAL CAUSES.

By Edward Reynolds, M.D., and L. V. Friedman, M.D.

Every gynecologist must have been struck by the fact that if we set aside the rare deaths due to technical mistakes, *e.g.*, deaths from secondary hemorrhage or accidental infection, almost all our losses are to be found in two classes of cases. First: deaths from hysterectomy done for large fibroids or cancer in feeble women (to which should, perhaps, be added the removal of excessively large tumors in any situation in the abdomen); and second, deaths from peritoneal infection due to the opening of infected masses, such as tubal, ovarian, or other abscesses.

The mortality in the first class of cases can, I believe, be greatly minimized by thorough constitutional preparation of the patient, rapid operating, careful technique, and in some cases, by the adoption of the vaginal method of attack. But with this class of cases the present paper is not intended to deal.

My experience in preceding years had impressed me so strongly with the considerable mortality necessarily incident to the abdominal extirpation of recently infected tubes and other collections of pus in the abdomen, and with the therapeutically good results of thorough vaginal drainage in such cases, that in the summer of 1899, I resolved to adopt the rule that in all cases of inflammatory masses in the pelvis which presented acute symptoms, and in which there had been

a fairly continuous temperature, averaging 100 or more during the attack for which the patient sought treatment, I would, if operation were indicated at all, confine myself to thorough drainage by the vagina, without attempting the removal of the affected viscus (excluding of course, cases in which a diagnosis of twisted pedicle, or similar non-purulent affections could be definitely established); and would persist in following this rule until I had obtained a sufficiently long series to estimate its result upon my mortality percentages. The cases on which this paper is based were consecutive and entirely unselected. They comprise so much longer a series of abdominal operations than I have ever before completed without mortality, as to have greatly confirmed my belief in the soundness of this principle; to which point, and to which point only, I now report them.

In following the rule I have not thought it necessary to be influenced by the position of the tumor, so long as it was definitely below the pelvic brim, as gynecological lesions must almost of necessity be. We know well that the escape of some pus collections into the abdomen is almost inocuous, while other collections of similar appearance may be exceedingly virulent, in accordance with their bacteriological reaction. I had expected to report also a study of the possibility of fully determining the degree of virulence by comparison of the clinical symptoms and the blood count for leucocytosis, taken beforehand, with the bacteriological examinations of the pus found; but as the results of my observation in this direction were thoroughly inconclusive, and as, in the conditions under which the work was done, I am not confident of the accuracy of all the scientific tests, I prefer to report the series as a purely clinical study, bearing only upon this one question of the relative mortalities of the abdominal extirpation and vaginal drainage, of acute tubes and other pelvic abscesses. Between June 6, 1899, and April 1, 1901, I performed 82 consecutive abdominal operations without a death, the series being preceded and followed by deaths, due in each instance to an abdominal extirpation of an ovarian abscess; the one, an operation performed in extremis after rupture, and the other under a mistaken diagnosis.

That the series was not composed mainly of trivial operations, but averaged on the whole a rather higher degree of severity than common will be seen by inspection of the careful summaries, and skeleton reports of the cases, which my coadjutor has prepared; and I want to reiterate here that I attribute the great improvement in my mortalities in this series as compared with my previous efforts solely to the almost complete exclusion from the abdominal list of recent pus cases.

In the comparatively few cases in which such pus was unexpectedly found during the course of an abdominal operation, the infected tubes were removed in toto, if the degree of adhesions permitted this to be done without undue prolongation or severity of operation.

In cases in which unexpected pus was buried beneath unusually dense adhesions, it was simply evacuated, drained with gauze in the abdominal wound, the vaginal vault opened, and through and through drainage established, as will be seen on looking at the reported cases.

In two similar cases I was able to obtain a shorter convalescence by abandoning the abdominal operation, so soon as the condition was recognized, and immediately draining by the vagina. In these cases the abdominal wound was closed by a sponge and a single provisional suture during the performance of the vaginal operation; this suture was then cut, and the adhesions again inspected from the abdominal side in a search for any possible escape of pus, after which the abdomen was closed. If the gloves and sleeves are changed, or the second abdominal exposure conducted by an assistant who has not been concerned in the vaginal operation, I believe such an exploratory abdominal incision to be an excellent procedure in some few cases in which the conditions present and the choice of route are both doubtful.

During the same period I performed 18 vaginal sections, all done for recent infection, or acute and threatening exacerbations of old symptoms, many of them upon exceedingly sick women; and had one death, due probably to a technical accident during after treatment, arising from a misunderstanding of orders on the part of one of my assistants. See

Case 99. It is difficult to convey a clinical impression satisfactorily in print, and for such points the statistical method is equally useless. It seems to me best simply to record my opinion that the class of cases submitted to vaginal section was such that abdominal sections performed upon the same women must necessarily have yielded a very high mortality, not less probably than 20 per cent.; which if I am right in this opinion, would have resulted in a very different length of series without mortality had the abdominal route been selected for them.

As regards the ultimate result of the vaginal sections I am unable to give any really satisfactory report, as with but few exceptions they were Hospital patients who were lost sight of within a few weeks or months after the operation. I can only say that at the time of their discharge from the Hospital the result, both therapeutic and anatomical, was usually good; that my previous experience has been that among private patients and in Hospital patients whom I have happened to see afterwards, the remote results of thorough vaginal drainage of pus, while not uniformly satisfactory, have as a whole been surprisingly good, both from the symptomatic and anatomical standpoint; and that in the few cases in which I have been obliged to perform a subsequent abdominal extirpation, the previous vagnial operation has not seriously complicated it. The form of operation which I have used in vaginal sections has consisted of a wide cut, usually across the posterior fornix, and frequently supplemented by an additional incision in the median line, thus making a total incision of the shape of a T. This first incision only penetrates the vaginal walls, but is always extended on the sides out to the pelvic walls, and posteriously as far as may be necessary to give good room. The vaginal incision having been carried to its full extent, the flaps are dissected back; then a similar incision is carried through each succeeding layer, until the abscess mass is itself plainly in view of the eye; its wall is then incised, and the incison extended with scissors, or the fingers, until it is as wide as the original incision in the vaginal vault. All edematous inflammatory tissue is torn open with the fingers as far as

possible, and the cavity is then lightly packed without douching. There is usually free venous bleeding until the abscess mass is opened, but it should receive no attention, as it is due to back pressure on the veins, and will cease as soon as the mass is lessened by the escape of its contents.

With the relief of tension from below furnished by free division of the supporting structures, even masses which are at first placed high in the pelvis descend within easy reach of the vaginal method of attack. The whole operation can usually be performed under the guidance of the eye, and in a surprisingly intelligent and diagrammatic manner. I believe our knowledge of the choice of cases for the vaginal method of attack in inflammatory pelvic disease, to be very far from complete, and with these preliminary observations I report my work of the last two years as a contribution towards its study. For the compilation of cases and clinical remarks I am indebted to Dr. Friedman.

The cases presented here have statistical value for several reasons. They form a genuinely consecutive series (covering two years) of non-selected cases. They include cases seen in private practice as well as those treated in a large public hospital, and it may be stated with very reasonable assurance that nearly half (31 out of 71) of the operations included under abdominal sections, were unusually difficult, as many of them were characterized by dense chronic adhesions, and their classification shows that of the one hundred cases, fifteen were hysterectomies, nine were caesarean sections, and four for extra-uterine pregnancy. There was no mortality in the 82 abdominal cases. The single death of the whole series occurred as the result of a distinctly post-operative accident following vaginal section. (See case 99.)

The vaginal sections are divided naturally into two classes:

I. Those cases in which a definite abscess cavity containing liquid pus (a pus-tube or an encysted peritonitis) was isolated by a more or less heavy wall of inflammatory exudate.

From these cases we may deduce four advantages of the vaginal over the abdominal route. (1.) The risk of general peritoneal infection is greatly diminished; for, with proper

technique the vaginal section becomes a dissection by means of which each layer is seen before it is incised, and the pus is reached long before there is danger to the general cavity which lies above the abscess, and is separated from it by a wall of exudate. (2.) Excellent drainage can be secured and maintained because the vent is at the bottom of the pocket, and can be wedge-shaped, that is the outlet can be made as broad as the greatest width of the pocket to be emptied. (3.) Vaginal hernia is a very rare sequence of vaginal section. (4.) Severe post-operative shock is almost unknown.

The efficiency of vaginal, or a combination of abdominal and vaginal drainage, is well illustrated by case No. 42. The abdomen was opened with the expectation of finding merely an adherent chronic tubal inflammation, dating from a criminal abortion with sepsis, two years previous. Instead, the pelvis was a bowl of foul, liquid streptococcus pus, which, with the dense adhesions, quite obscured the anatomical relations. These conditions prohibited radical operation; consequently the vaginal vault was pierced and the pelvis drained with gauze in both directions. Forty-eight hours later the gauze drains were replaced by a rubber tube of large calibre which passed into the abdominal wound and out of the vagina. The bore of this tube was kept clear (in spite of a fecal fistula which appeared on the fifth day) by frequent irrigation with boiled water. The convalescence was protracted, but when seen six months after operation, not only was the patient in apparent health, symptomatically well, and working, but menstruation was regular and painless, and a careful bi-manual examination failed to reveal any mass of pelvic exudate.

II. Those cases characterized by the infiltration and subsequent degeneration of the cellular tissue of the pelvic septa.

In these cases vaginal section gave no immediate and obvious result — frequently there was no pus and only a small amount of lymph drained by the incision; yet the therapeutic result was unquestionable. These cases were commonly in patients with a history of long-standing inflammation, who by a recent acute exacerbation had been driven to bed with pain

and a persistent slight elevation of temperature. There were also acute cases (cf. Nos. 82 and 91) with the frank symptoms of acute pyo-salpinx or encysted peritonitis; high temperature and pulse, distention, exquisite abdominal pain and tenderness, nausea and vomiting.

In the cases with a previous history there had been apparently an absorption or partial organization of pus, or of the lymph of an encysted peritonitis and the searching finger entered a cavity, the walls of which were formed of thick fibrous inflammatory exudate. In the acute cases a cavity remained after the passage of the finger through the partially disorganized cellular tissue. In either case the result of the section was a rapid drop in temperature and pulse, with prompt symptomatic relief.

Only a short period of complete anæsthesia was required. There was little or no shock; patients bore nourishment by the mouth early, and usually on the fourth day had a general diet; at the end of a week or ten days they left their beds. This rapid resumption of systemic tone with its consequent possibilities of fresh air was in strong contrast to the longer convalescence in bed of the abdominal cases. Considering the excellent anatomical condition of patients seen months after operation, it seems quite possible that vaginal section, in selected cases, may leave the patient with pelvic organs capable of normal function, and if this be true it should have precedence over the radical operation which is, after all, always available after the failure of the vaginal operation to secure an absolute result.

CLASSIFIED SUMMARY.

Abdominal salpingectomy or appendectomy for inflammatory disease	20
Abdominal hysterectomy for inflammatory disease	9
" " " fibroid "	2
" " " other causes	2
Vaginal hysterectomy for carcinoma	2
Abdominal section for separation of adhesions	3
" " " ventro-suspension, only	11
" " " extra-uterine pregnancy	4
" " " cæsarean section	9
Carried forward	62

Brought forward	62
Abdominal section for oöphorectomy	9
" " " myomectomy	2
" " " hydro-salpinx	2
" " " pelvic abscess	1
" " (exploratory)	4
*Lumbar nephrectomies	3
Vaginal section for inflammatory disease	18
	101
Deducted for case counted twice	1
Total	100

1. *June 6, 1899.* Boston City Hospital. M. G., twenty-six, single. Left salpingo-oöphorectomy in 1897. Chronic tubes (probably gonorrhœa in origin) abdominal hysterectomy. Discharged July 1, 1899.

2. *June 7, 1899.* Mrs. M., seen with Dr. Flanders. History of typical marital gonorrhœa 2 years ago. Acute exacerbation just past. Salpingo-oöphorectomy, ventro-suspension. Good convalescence. Symptomatically well a year later.

3. *June 27, 1899.* Mrs. T., seen with Dr. F. J. Canedy. Abdominal section, bilateral salpingectomy. Distended, unruptured tube with ruptured ovum, ventro-suspension. Good convalescence.

4. *July 5, 1899.* Boston City Hospital. E. B., twenty-seven, single. Abdominal hysterectomy for chronic salpingitis. Discharged relieved in five weeks.

5. *July 12, 1899.* Boston City Hospital. P. G., thirty-six, married. Abdominal section, ovariotomy (cystic ovary), ventro-suspension. Inoperable retro-peritoneal myxo-lipoma. Discharged relieved in three weeks.

6. *July 19, 1899.* Boston City Hospital. M. H., thirty-nine, married. Chronic salpingitis (puerperal in origin) abdominal section, right salpingectomy, ventro-suspension. Discharged well in six weeks.

7. *July 21, 1899.* Boston City Hospital. E. C., forty, married. Abdominal hysterectomy. Uterus removed to facilitate control of bleeding following removal of double chronic salpingitis and ovarian abscess. Discharged relieved in six weeks.

8. *July 26, 1899.* Boston City Hospital. E. S., twenty-two, married. Abdominal section, bilateral salpingectomy, ventro-suspension. Discharged relieved, August 30.

9. *Sept. 2, 1899.* Boston City Hospital. Twenty-four, single. Chronic salpingitis, abdominal salpingo-oöphorectomy and ventro-suspension. Discharged well in four weeks.

* Case No. 28 had both lumbar and abdominal incisions.

10. Sept. 4, 1899. Boston City Hospital. D. C., thirty-nine, married. Fibro-myomata, abdominal hysterectomy. Discharged well on September 28.

11. Sept. 5, 1899. Boston City Hospital. A. N., nineteen, single. Chronic salpingitis, abdominal section. Bilateral salpingectomy, ventro-suspension. Discharged relieved September 29.

12. Sept. 7, 1899. Boston City Hospital. K. R., thirty-nine, married. Carcinoma, exploratory laparotomy. Inoperable malignant disease. Discharged relieved October 13.

13. Sept. 8, 1899. Boston City Hospital. L. P., thirty, married. Hydrosalpinx, abdominal section. Left salpingectomy and ventro-suspension. Discharged relieved September 28.

14. Sept. 11, 1899. Boston City Hospital. W. B., forty-two, married. Cyst of broad ligament, abdominal section. Bilateral salpingectomy. Discharged relieved October 12.

15. Sept. 14, 1899. Boston City Hospital. C. McD., twenty-two, single. Acute and chronic salpingitis, abdominal hysterectomy. Temperature and pulse normal after fourth day. Discharged relieved October 14.

16. Sept. 15, 1899. Boston City Hospital. M. J., forty-three. married. Adeno cystoma of ovary, abdominal ovariotomy. Temperature and pulse practically normal throughout convalescence.

17. Sept. 18, 1899. Boston City Hospital. E. C., thirty-three. married. Chronic salpingitis, abdominal section, bilateral salpingectomy. Temperature and pulse normal after eighth day.

18. Sept. 19, 1899. Boston City Hospital. M. F., twenty-two, married. Chronic salpingitis, abdominal salpingectomy. Temperature and pulse normal after third day.

19. Sept. 20, 1899. Boston City Hospital. L. S., twenty-four, married. Abdominal section (exploratory). Encysted peritonitis, pus, abdominal and vaginal drainage. Discharged well on November 2.

20. Sept. 21, 1899. Boston City Hospital. M. T., twenty-six, widow. Cysts of ovary, abdominal ovariotomy and ventro-suspension. Temperature and pulse normal after second day.

21. Sept. 23, 1899. Boston City Hospital. S. A., thirty-five, married. Cyst of broad ligament, abdominal salpingectomy. Temperature and pulse normal after fifth day.

22. Sept. 28, 1899. Boston City Hospital. A. B., twenty-three, single. Cysts of ovary, abdominal ovariotomy and ventro-suspension. Temperature and pulse normal after third day.

23. Sept. 30, 1899. F. McD., thirty-two, married. Hydro-salpinx. Bilateral salpingectomy and ventro-suspension. Chronic adhesions. Discharged relieved December 18.

24. Oct. 5, 1899. S. B., seen with Dr. A. Davidson. Acute appendicitis, abdominal section, appendectomy and suturing of movable kidney. Good convalescence.

25. Oct. 9, 1899. C. F., twenty-three, single, seen with Dr. E. F. Gage. Adherent retroversion, abdominal section, ventro-fixation. Excellent convalescence.

26. Oct. 25, 1899. L. B., sixty-one, single. Ovarian cyst, abdominal section. Removal of cyst. Good convalescence.

27. Oct. 27, 1899. S. O., thirty-seven, married, seen with Dr. W. H. Allen. Splanchnoptosis with adhesions, abdominal section. Adhesions separated and uterus suspended. Good recovery.

28. Nov. 15, 1899. Mrs. G., seen with Dr. C. H. Bangs. Congenital undeveloped kidney, abdominal section for relief of pelvic adhesions. Lumbar nephrectomy. Good recovery.

29. Nov. 23, 1899. E. C., twenty-five, single, seen with Dr. E. W. Dwight. Retroflexion and dysmenorrhœa, abdominal section. Right salpingo-oöphorectomy and ventro-suspension. Good recovery.

30. Dec. 11, 1899. E. S., thirty, married, seen with Dr. H. Jackson. Retroflexion, abdominal section, ventro-suspension. Good recovery.

31. Jan. 3, 1900. Mrs. K., seen with Dr. W. E. Ford. Retroversion, abdominal section, ventro-suspension. Good result.

32. Jan. 22, 1900. E. S., thirty-eight, single, seen with Dr. West. Retroversion, myoma, abdominal section, ventro-suspension, myomectomy. Good result.

33. Jan. 23, 1900. E. W., twenty-six, single, seen with Dr. H. Jackson. Retroversion, adherent ovary, abdominal section, ventro-suspension, adherent ovary raised. Good convalesence.

34. Jan. 24, 1900. L. W., fifty-eight, married, seen with Dr. Goodman. Adherent retroversion, abdominal hysterectomy (for pain). Good recovery.

35. Feb. 19, 1900. Mrs. T., seen with Dr. F. Pfaff. Chronic salpingitis and fibroid, abdominal section, myomectomy. Bilateral salpingectomy. Acute suppression and pneumonia during convalescence. Good recovery.

36. Mar. 7, 1900. E. L., forty-four, married, seen with Dr. J. E. Goldthwaite. Salpingitis, abdominal salpingectomy, ventro-suspension.

37. Mar. 26, 1900. M. S., thirty-seven, married, seen with Dr. C. E. Parker. Tubercular kidney. Lumbar nephrectomy. Good recovery.

38. Mar. 29, 1900. Mrs. H., seen with Dr. Mitchell. Retroversion, abdominal section, ventro-suspension. Good result.

39. May 10, 1900. Mrs. H., seen with Dr. Cutter. Mass of adherent intestines, adherent senile uterus, abdominal hysterectomy. Good recovery.

40. May 17, 1900. Mrs. W., twenty-eight, married, seen with Dr. Pfaff. Chronic pelvic peritonitis, abdominal salpingectomy, ventro-suspension. Rapid convalescence.

41. June 4, 1900. Boston City Hospital. J. F., twenty-seven, married. Old ovarian abscess, abdominal salpingo-oöpherectomy. Temperature and pulse normal after fourth day.

42. June 5, 1900. Boston City Hospital. M. H., thirty, single. Pelvic abscess, abdominal section, all plevic relations obliterated, free pus. Drained abdominally and by vagina. Protracted convalescence. Excellent symptomatic result. Fecal fistula appeared on tenth day and persists.

43. Aug. 9, 1900. Mrs. O., seen with Dr. F. J. Canedy. Carcinoma of liver. Abdomen opened for exploration on question of ovarian tumor. Good recovery from operation.

44. Aug. 15, 1900. Boston City Hospital. F. A., eighteen, married. Acute salpingitis, chronic appendicitis, with abscess. Abdominal salpingectomy and appendectomy. Discharged relieved September 10.

45. Aug. 28, 1900. Boston City Hospital. N. K., twenty-two, widow. Chronic appendicitis, ovarian abscess, abdominal salpingectomy and appendectomy. Discharged relieved October 6.

46. Aug. 30, 1900. Boston City Hospital. E. P., twenty, married. Cystic ovary, chronic adhesions, abdominal salpingectomy. Temperature and pulse normal after third day.

47. Sept. 3, 1900. Boston City Hospital. E. M., fifty-eight, widow. Prolapsus uteri, abdominal section, ventro-suspension. Good result. Discharged well October 3. Temperature and pulse normal after second day.

48. Sept. 8, 1900. Boston City Hospital. I. O., thirty-two, married. Retroversion, abdominal section, ventro-suspension. Discharged well October 2.

49. Sept. 8, 1900. E. D., twenty-six, single. Chronic appendicitis, adherent retroversion, abdominal section, appendectomy and ventro-suspension. Normal convalescence.

50. Sept. 12, 1900. Mrs. W., seen with Dr. C. E. Miles. Kidney infiltrated with gravel. Lumbar nephrectomy. Uneventful convalescence.

51. Jan. 8, 1900. T. J., twenty-nine, married, seen with Dr. Reed of Newton. Inguinal herina, ovaries much enlarged. Excision of sac. Bilateral ovariotomy through the ring. Good convalescence.

52. Sept. 17, 1900. Mrs. W., twenty-six, seen with Dr. W. H. Pierce. Myoma, partial intestinal obstruction. Myomectomy and separation of adhesions. Good convalescence.

53. Sept. 18, 1900. Mrs. B., seen with Dr. G. C. Kilgore. Retroflexion, abdominal section, ventro-suspension. Normal convalescence.

54. Oct. 5, 1900. Mrs. C., fifty-nine, seen with Dr. G. C. Kilgore. Multiple ovarian cystoma, abdominal section, removal of ovarian tumor. Excellent convalescence.

55. Nov. 30, 1900. Mrs. B., thirty-four, seen with Dr. Painter. Extra-uterine pregnancy, abdominal section, salpingectomy and ventro-suspension. Good recovery.

56. Jan. 15, 1901. Mrs. W., fifty, seen with Dr. O. E. Johnson. Multiple fibroids, abdominal hysterectomy. Good recovery.

57. Feb. 10, 1901. Boston City Hospital. E. H., twenty-two, married. Chronic salpingitis, abdominal hysterectomy. Temperature and pulse normal after sixth day.

58. Feb. 13, 1901. Boston City Hospital. M. S., thirty, married. Chronic salpingitis, abdominal salpingectomy and removal of fundus. Temperature and pulse normal after third day.

59. Feb. 20, 1901. F. M., thirty-five, single. Abdominal hysterectomy for pain. Dense pelvic adhesions. Good result.

60. Feb. 27, 1901. Boston City Hospital. M. T., twenty-six, married. Chronic salpingitis, abdominal hysterectomy. Temperature and pulse normal after seventh day.

61. Mar. 4, 1901. Boston City Hospital. M. B., twenty-seven, single. Retroversion, with adhesions of right broad ligament to mesentery of appendix, abdominal section. Temperature and pulse practically normal throughout convalescence.

62. Mar. 4, 1901. Boston City Hospital. J. B., forty, single. Retroversion and acute anteflexion, abdominal section to separate adhesions, followed by "Dudley." Temperature and pulse normal after second day.

63. Mar. 9, 1901. Mrs. S., thirty-seven, seen with Dr. S. A. Houghton. Extra-uterine pregnancy, abdominal section. Rapid convalescence.

64. Mar. 17, 1901. Boston City Hospital. L. R., twenty-five, married. Chronic salpingitis. Amputation of fundus with appendages. Adhesions and pus. Discharged well in four weeks.

65. Mar. 18, 1901. Boston City Hospital. H. Y., forty-five, married. Adherent retroversion, abdominal section. Adhesions freed, uterus fixed. Temperature and pulse normal throughout convalescence.

66. Mar. 11, 1901. Boston City Hospital, A. J., thirty-six, married. Adherent retroversion, abdominal section, ventro-fixation. Temperature and pulse normal after fourth day.

67. Mar. 20, 1901. Boston City Hospital. C. D., thirty-two, married. Extra-uterine pregnancy, abdominal section, salpingectomy for hæmorrhage. Temperature and pulse practically normal throughout convalescence.

68. Mar. 22, 1901. Boston City Hospital. C. G., twenty-seven, married. Acute salpingitis, abdominal section, bilateral salpingectomy, drainage by vagina. Temperature and pulse practically normal throughout convalesence.

69. Mar. 25, 1901. Boston City Hospital. A. O'N., thirty-three, married. Tubo-ovarian cyst, abdominal salpingo-oöphorectomy, ven-

tro-suspension. Convalescence complicated by abcess of abdominal scar and dendritic corneal ulcer.

70. Apr. 1, 1901. Boston City Hospital. N. X., twenty-three, married. Chronic salpingitis, abdominal salpingectomy and amputation of fundus. Good recovery.

71. Apr. 1, 1901. Boston City Hospital. M. D., fifty-five, married. Exploratory laparotomy, inoperable intestinal carcinoma. Temperature and pulse normal throughout convalescence.

72. June 5, 1899. Mrs. W., seen with Drs. C. W. Townsend, and W. A. Putnam. Caesarean section for justo-minor pelvis. Mother and child discharged well.

73. July 18, 1899. Mrs. P., seen with Dr. O. E. Johnson. Caesarean section for justo-minor pelvis. Mother and child discharged well.

74. Oct. 18, 1899. Mrs. K., seen with Dr. J. P. Torrey. Caesarean section for justo-minor pelvis. Mother and child discharged well.

75. Dec. 27, 1899. Mrs. R., at Boston Lying-in Hospital. Caesarean section for justo-minor pelvis. Mother and child discharged well.

76. June 11, 1900. Mrs. L., at Boston Lying-in Hospital. Caesarean section for generally contracted pelvis. Mother and child discharged well.

77. June 18, 1900. Mrs. R., at Boston Lying-in Hospital. Caesarean section for generally contracted pelvis. Mother and child discharged well.

78. June 20, 1900. Mrs. S., at Boston Lying-in Hospital. Caesarean section for oblique kyphotic pelvis. Mother and child discharged well.

79. Sept. 10, 1900. Mrs. W., at Boston Lying-in Hospital. Caesarean section for oblique pelvis (anchylosed hip joint). Mother and child discharged well.

80. Sept. 28, 1900. A. C., at Boston Lying-in Hospital. Caesarean section for generally contracted, flat pelvis. Mother and child discharged well.

81. July 5, 1899. Boston City Hospital. E. P., forty-two, married. Pelvic abscess drained abdominally a month previous. Now drained by vagina. Discharged relieved July 29.

82. July 25, 1899. Boston City Hospital. J. S., twenty-four, single. Acute salpingitis. Abdomen opened, but on seeing acute tubes it was closed and vaginal section performed, no pus obtained. Drainage by vagina. Temperature and pulse practically normal throughout convalescence.

83. Sept. 5, 1899. Boston City Hospital. E. M., twenty, single. Acute pyo-salpinx. Vaginal incisions into large cavities in broad ligaments, no pus obtained. Drainage. Temperature and pulse normal after third day.

84. Sept. 29, 1899. Boston City Hospital. N. F., twenty-three, married. Acute pelvic inflammation. Vaginal section, no pus obtained. Drainage. Discharged relieved October 24.

85. Sept. 29, 1899. Boston City Hospital. M. S., thirty-nine, married. Abscess of utero-vesical space. Vaginal section, free pus. Drainage. Temperature and pulse normal after third day.

86. Oct. 6, 1899. Boston City Hospital. J. A., sixty-one, married. Adeno-carcinoma. Vaginal hysterectomy, ligatures and clamps. Discharged relieved November 2.

87. June 14, 1900. Boston City Hospital. E. C., twenty-five, married. Old pelvic abscess. Vaginal dissection with incision of both tubes, much viscid brown fluid. Drainage. Discharged relieved July 14.

88. Aug. 8, 1900. Boston City Hospital. M. C., thirty-five, married. Pelvic abscess. Vaginal section, laying open large pus cavity high on posterior wall of uterus. Discharged relieved September 15.

89. Aug. 13, 1900. Boston City Hospital. M. P., thirty-one, married. Acute pelvic inflammation. Vaginal section, no pus-cavities. Drained. Temperature and pulse normal after third day.

90. Aug. 24, 1900. Boston City Hospital. B. C., twenty-seven, married. Pelvic abscess. Vaginal section, cheesy detritus and pus. Temperature and pulse normal after the fourth day.

91. Aug. 31, 1900. Boston City Hospital. G. H., twenty-four, single. Acute pelvic inflammation. Vaginal section, cavities entered on either side, no pus. Drainage. The temperature which had been 103°–105° before operation did not exceed 100° after operation, and was normal on and after the seventh day.

92. Sept. 20, 1900. Boston City Hospital. C. McN., married. Pelvic inflammation. Acute attack, chill, etc., five days previous. Vaginal section of inflammatory fibroid-like mass with walls one-half inch thick, no pus, but some lymph. Temperature and pulse practically normal throughout convalescence.

93. Sept. 29, 1900. Boston City Hospital. L. M., thirty-two, married. Old pelvic inflammation. Vaginal section, cavity opened, no pus. Drainage. Good recovery. Temperature and pulse normal after second day.

94. Oct. 23, 1900. Mrs. D., seen with Dr. Bush. Vaginal section, tubal pus. Drainage. Good recovery.

95. Feb. 6, 1901. Boston City Hospital. A. L., thirty-one, married. Encysted pelvic peritonitis. Vaginal section, cavity opened and opalescent fluid drained. Temperature and pulse normal throughout convalescence of nineteen days.

96. Feb. 13, 1901. Boston City Hospital. D. M., thirty-seven, married. Carcinoma uteri. Vaginal hysterectomy. Discharged well March 6.

97. Feb. 25, 1901. Boston City Hospital. A. C., thirty-three, married. Acute pelvic abscess. Vaginal section, cavity opened, fluid and necrotic material drained. Discharged relieved April 2.

98. Feb. 26, 1901. Miss S., seen with Dr. Cunningham. Acute pelvic abscess, probably appendiceal in origin. Vaginal section opened a large cavity, draining lymph and pus. Good convalescence.

99. Mar. 11, 1901. Boston City Hospital. K. R., forty-one, married. Pelvic mass. Temperature and pulse elevated. Vaginal section opened a large cavity filled with blood clot. Drainage. A misunderstanding of orders by an assistant resulted in a too early removal of the gauze and a secondary hemorrhage, in controlling which there was probably an infection. Patient died septic, March 30.

100. April 8, 1901. Boston City Hospital. S. W., twenty-five, married. Acute pelvic abscess. Vaginal section, pus. Ureter injured (?). Discharged relieved June 11. No urinary fistula.

IV.

THE TREATMENT OF PUERPERAL INFECTIONS AT THE BOSTON CITY HOSPITAL.

BY FRANK A. HIGGINS, M.D.

THE considerable number of puerperal infection cases admitted each year to the gynecological wards of The Boston City Hospital renders their study of value not only from the clinical side but from the administrative and medico-legal sides as well.

Under the term of puerperal infections I have included all cases of septic poisoning arising after the discharge of a fetus from the uterus, whether occurring at the end of the normal gestation period or after interruption of pregnancy in the early months.

The cases of infections after abortions are included because the character and course of the disease does not differ in them from those of full term delivery; the causes are the same, and disease is as frequently fatal. Moreover in this connection the writer desires to call attention to the large number of abortions which are annually treated in the hospital wards, a large proportion of which are confessedly of criminal origin. From this class of cases come many of the most serious and fatal infections, yet the majority of the cases of abortion cannot be considered as septic, nor do they become so in fact. This may be attributed to the fact that usually with the first signs of impending trouble of this nature the patients are at once hurried into the hospital, where with the prompt emptying of the uterus of its putrid contents, further septic absorption which is only just beginning, is prevented, and the patients' symptoms even although very acute rapidly subside, and the patients themselves make a quick and rapid recovery.

The recovery may be complete without any apparent permanent damage to the pelvic organs being left as the result of the criminal operation, although a retroverted uterus, a prolapsed and sensitive ovary or an inflamed fallopian tube usually follows to give rise to constant annoying and more or less painful symptoms which ultimately require operative relief. It is a common occurrence to see patients enter the hospital with all the symptoms of an impending acute septicæmia from an abortion either complete or incomplete, with a high temperature ranging from 103 to 105 degrees and a pulse of 120 to 130 per minute, with foul discharge and uterine tenderness, and after complete emptying of the uterus with a curette, with antiseptic douching and the institution of the regular hospital regime, the pulse and temperature rapidly fall to normal, often within twenty-four hours, and usually within two or three days. These cases cannot properly be classed under the head of the septic infections, although the early symptoms of the disease are present, and many of them would undoubtedly develop a grave form of puerperal septicæmia if early treatment were not carried out. Emptying the uterus removes all foreign material which may be the seat of the trouble, prevents further decomposition and the absorption into the system of its products. If the septic process has not then advanced too far, and the body generally invaded, elimination is rapid, and the system quickly regains its normal condition.

Such cases should not be classed then with those of general infection since the infective focus which is present in the uterus is a local one and is removed before the general circulation becomes infected, or there is opportunity for much absorption of toxine material, and consequently recovery is usually easy and not delayed. This would seem to be a strong argument in favor of curettage of the uterus if performed early and with care as a means of aborting puerperal infection.

The writer also believes that infection after abortions, while as we all know not infrequently is of a severe and fatal type, is usually less rapid in its onset and more favorable for treatment when seen early than is infection after labor in the

later months. This is true because infections in labor are usually more direct, through lacerations, or immediately at the placental site and there is nothing to prevent rapid invasion by the micro-organisms. In abortions, however, there are fewer lacerations exposing raw surfaces, the placenta is often retained and adherent, and there being no raw surface exposed the entrance of the infection is delayed for a certain time until the placenta itself is invaded.

During the year 1900 there were 81 cases of abortion treated in the gynecological wards of the City Hospital, a few of these being accidental, yet a large proportion were undoubtedly of criminal origin. These cases remained in the hospital for periods varying from 2 to 50 days, averaging a little more than 18 days each, but with a total of 1,469 days for the whole number of cases. This number is of course only a small part of the whole number of criminal abortions produced in the City of Boston in a year, yet the expense of even this number is so considerable that it may be considered how far the city and the hospital should go in caring for these cases, and furthermore if it is not possible, under suitable legislation and more stringent laws, to remove a large proportion of this evil and to make the conviction of abortionists more of a certainty.

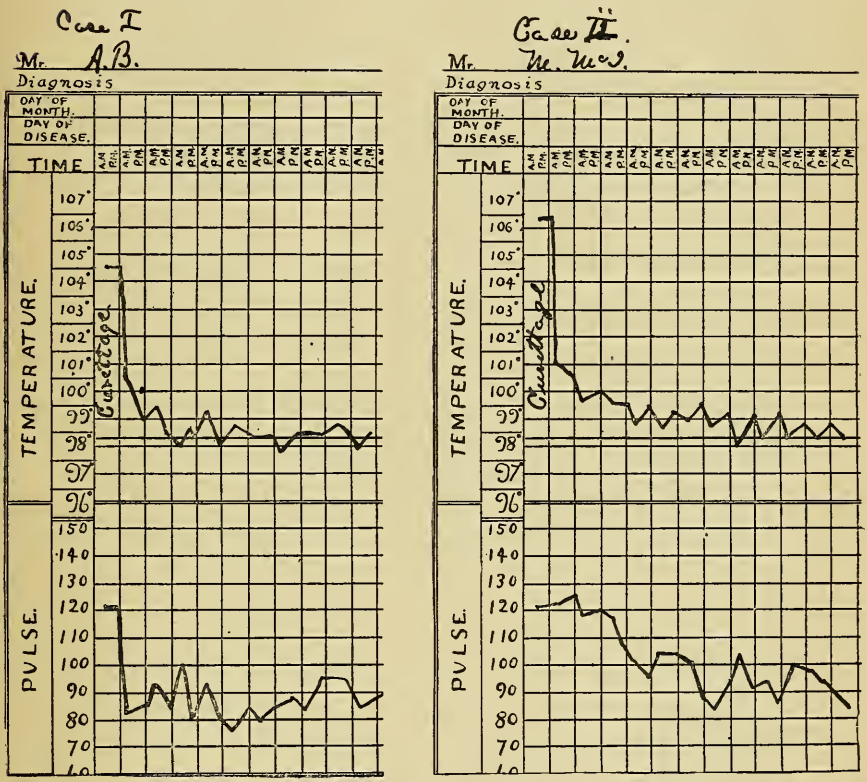
Of the 81 cases of abortion, 11 were typical cases of general puerperal septicæmia, seven of the eleven recovered, and four proved fatal under treatment. Several of these cases which recovered are interesting from the clinical side, and a few notes in connection with them are given. In one case the placenta was retained for one week after a criminal abortion, streptococci were found in the uterus, the uterus was curetted lightly without ether and intrauterine douches given. She remained in the hospital 37 days, but finally made a good recovery, with only a slight one-sided salpingitis remaining. In still another case the patient aborted in September; she flowed continuously after the abortion, but did not enter the hospital for more than three months after when acute symptoms of infection first occurred. The placenta was found retained almost intact and was removed by the curette. This patient developed an acute pelvic cellulitis

and later a phlebitis of the femoral vein of one leg. She ultimately made a good recovery, although it was somewhat protracted.

There were 70 cases of abortion treated in the hospital which did not become septic, although 41 were curetted, generally for acute symptoms of a threatening infection. Many of them also had hemorrhages, retained products, and a foul discharge. There were 29 cases of abortion which recovered under bed and tonic treatment without requiring operation. All of the 41 cases recovered on which it was found necessary to perform curettage. In most of these convalescence was rapid, but in a few because of debility and anæmia from hemorrhage recovery was delayed. In patients suffering from incomplete abortion, with retained conceptive products in the uterus, threatened infection, high pulse and temperature, uterine tenderness and foul lochia, the recovery is usually uninterrupted and rapid after emptying the uterus, the pulse and temperature soon drop to normal and the infection is thus aborted. I have selected two charts at random. Cases I. and II. from among this considerable number of cases. They show particularly well the rapid fall of pulse and temperature after thoroughly emptying the uterus and illustrate particularly well the necessity for curettage in many cases.

During the year 1900 there were 38 cases of puerperal infection treated in the Gynecological wards, 11 cases occurred as the result of abortions, and have previously been mentioned, while the remaining 27 came on as the result of delivery after the seventh month. On the average these cases are probably as serious as can be found in any clinic, since, as a rule, only those profoundly ill are sent to the hospital, and then often as a last resort after failure of outside treatment. There were 16 fatal cases among the 38, a mortality of 42 per cent., but this mortality rate is of practically no value in estimating the general death rate from puerperal infections because of the reasons given above. The general mortality of puerperal septicaemia is however estimated to be about 25 per cent. in all cases, mild or severe. Three of the fatal cases were moribund on admission and survived only a few

hours, one having septic pneumonia, and another septic pneumonia and endocarditis. A number of others entered the hospital after prolonged illness and survived only a few days; one entered seven weeks after delivery, having a pelvic abscess which had been punctured; another after four weeks illness and lived only four days in the hospital; still another after 14 days, and survived only two days in the hospital.



CASES I. and II. — Of incomplete abortion, showing rapid fall of pulse and temperature to normal after curettage.

Three cases were complicated by septic pneumonia, three by endocarditis, two by mania, and one by phlegmasia dolens of both legs and also purpura. There was also profound mania in one case, which eventually recovered, and a milder form in another patient, who also recovered.

The antistreptococcus serum was administered to five of these cases, only one of which recovered. These five cases

were all directly under the care of the writer, and the results have already been published at length in another paper. It is sufficient to say here therefore in regard to the antistreptococcus serum that its effects on the patient are very depressing, that its use is not without danger, and that it should be used with great care, in moderate doses, and then only in the most serious cases.

The 22 cases of infection which recovered, although the majority had severe infections, were, as a rule, without serious complications and made good but slow convalescence, one had septic pneumonia, two acute mania, two phlegmasia dolens, and two developed salpingitis. Undoubtedly also others developed pelvic troubles of a permanent nature, but these did not become apparent while the patients were under observation in the hospital. Each year, however, many patients enter the gynecological wards with various forms of pelvic disease whose origin is directly traceable to a previous abortion or a septic puerperium.

Numerous instances of fresh lacerations of the cervix are found among the infectious cases, and the writer believes that these fresh tears are the avenue by which the infectious material gains an entrance in many patients.

No regular treatment has been carried out as a matter of routine in all cases. Many cases are promptly curetted immediately on admission to the hospital, and it is believed that by so doing serious infections are thus headed off in many instances. If the infectious process has not extended beyond the endometrium, if the uterus remains large and soft, if there are retained products and there is a profuse foul discharge from the uterus, it is believed that curettage is of marked benefit in that it removes the focus of the disease and the decomposing material, and that it favors involution of the uterus. If there are no retained products and the uterus is firmly contracted it is useless to curette, as it is probable that there has been direct absorption of the infectious organism at the placental site or through cervical or vaginal lacerations.

Curettage of the puerperal uterus is an operation easily and quickly performed, causing little pain and no shock, and for which it is usually unnecessary to give an anaesthetic. Follow-

ing curettage, and in certain cases when that operation is not necessary, intrauterine douches of a dilute antiseptic solution once or twice daily are of value chiefly for their effect in washing away putrid discharges. Weak bichloride and also sterile normal salt solution have been used in large quantities, and the latter, so far as can be determined, seems to be as efficacious as the former. Recently, however, weak solutions of formalin, one-half to one per cent., have been used in a number of cases with apparently good results. The antiseptic qualities of formalin are well known, and in addition it seems to have certain penetrating powers not possessed by the other antiseptic solutions.

From marked success in the treatment of several cases of old sinuses which had resisted all attempts at healing by all other methods, the writer was led to use formalin in intrauterine douching.

Nearly every rational method of treatment proposed for puerperal infection has been tried at the hospital, but with no better success than has been attained by the means mentioned here. Hysterectomy, however, has not been done as yet. The subcutaneous injection of normal salt solution, which has been reported as curative in a number of cases, seems to act as a stimulant only, and to a limited extent.

V.

THE TREATMENT OF PILES BY THE INJECTION OF CARBOLIC ACID.

BY GEORGE W. GAY, A.M., M.D.

THE object of this paper is to draw attention to the method of treating a certain form of hemorrhoids by the injection of a weak solution of carbolic acid. The method has heretofore been largely in the hands of pretentious and unreliable people. Nor have the educated surgeons always treated the subject with that calm, judicial spirit demanded for all proposed plans of combatting disease. The method has been lauded to the skies, and condemned to oblivion, both of which verdicts are unwise, as well as untrue.

While the field of this operation is limited, yet it has considerable value, and can be used with confidence and satisfaction in appropriate cases. The operation has been brought into disrepute by being applied to unsuitable cases, by using a preparation of too great strength, and in too large quantities. By paying sufficient attention to these three points the method will give satisfaction, and prove of enough value to give it a recognized standing in the treatment of internal piles.

It is to be distinctly understood, that in a majority of cases this plan of treatment is simply palliative. The palliation, however, is not infrequently so pronounced, that nothing further in the way of an operation is required.

The operation is safe. It can be done in the physician's office without fear of any untoward results. It is not painful, and hence requires no anæsthetic nor opiates. It does not lay the patient up, nor does it interfere with his usual vocation or habits of life. Bleeding is controlled; protrusion is prevented; and the tumors are so shrivelled up

that they give little or no discomfort for an indefinite period. The treatment can be resorted to in case of relapse at any time with the prospect of very considerable relief.

The writer has used this method of treating a certain variety of piles a number of times during the past ten years, and, with one exception, has never seen any undesirable results. The case referred to was one of *external* piles, and therefore, was not suitable for this method of treatment.

As showing the usual results of this mode of treating internal piles a brief reference may be made to a few cases in the experience of the writer. An elderly gentleman well known in this city, underwent an operation by ligature for piles several years before I saw him. He had two internal piles the size of a large filbert, which protruded at stool, bled freely, and were more or less painful. Each was injected once, and the operation was repeated a year later. The relief was satisfactory to patient and myself. A physician's wife had one pile the size of a walnut, which gave a good deal of trouble. One injection relieved her so effectually that no other treatment was required for at least two or three years, as reported by her husband. A gentleman of leisure, and sedentary habits has been troubled with an internal pile of moderate size for six or eight years. It has been injected several times at intervals of about one year with considerable relief. As the tumor is a little larger every time he applies for treatment a more radical operation may be required some time for his relief. Thus far he has been very well satisfied with this mode of treatment.

The worst case of hemorrhoids I ever treated by this method was that of a commercial traveller, who had several large internal piles, which bled so profusely at every stool that he was driven to seek relief. As it happened to be in the midst of his busiest season he begged for some sort of treatment which would not lay him up. On being told that the injection method might relieve, but would not cure him, he eagerly accepted it. Two piles were injected at intervals of one week for three weeks. The relief was so complete that for two years he thought himself too comfortable to resort to any further radical measures. The

hemorrhage was controlled to a great extent, the tumors were shrunken, so as to give little trouble, and he was able to continue his business as well as usual. He was not cured, and very likely further measures will be necessary in the future to permanently relieve him of his infirmity.

A radical cure is not to be expected in a majority of cases. The relief, however, is usually very pronounced, and lasts for an indefinite time.

In applying this mode of treatment especial attention should be paid to the following points, viz.:

1. The variety of piles.
2. The strength of the solution.
3. The amount used at each treatment.

Internal piles are the only ones that should ever be subjected to this method of treatment. Those piles which are above the internal sphincter, or which will remain there, when so placed, are the proper ones, and, so far as the writer knows, the only variety that will yield satisfactory results from the treatment by injection. This point is of vital importance to the success of the operation. External piles are made worse by the procedure, as they swell up, and are sorer and more troublesome in every way after injection.

The strength of the solution of carbolic acid should not exceed 10 per cent. The writer has always used the following: Carbolic acid (95 per cent.) one part, glycerine and water, each, one part. I have had no experience with any other preparation, but can recommend this one, as being efficient, and not attended by any unfavorable symptoms.

The amount of solution, which should be injected into each pile, depends upon the size of the tumor. For one as large as an ordinary filbert, one minim is sufficient. For larger ones two minims are required. More than this last amount is seldom necessary. In the experience of the writer this quantity has never produced any untoward results.

The operation may be performed in the following manner: the patient is directed to sit upon the stool for several minutes, and strain as in the effort to evacuate the bowels. In this way the piles are distended and brought down to the

anus. The patient then lies down upon his left side with knees well drawn up. With his right hand he raises his right buttock, and strains down again, while the operator gently opens the anus with the fingers of his left hand, in case the piles are not in plain sight. An ordinary hypodermic syringe having a sharp needle and charged with the solution is thrust into the pile, and one or two minims injected into its centre. The needle is slowly withdrawn, and the piles replaced above the internal sphincter.

The introduction of the needle is not painful, and the carbolic acid causes only a slight burning sensation, which is of short duration. The patient goes about his ordinary business. The bowels are encouraged to move regularly, and no change is made in his daily habits.

The operation may be repeated in a week or later. I never inject more than two piles at one visit, and have never had occasion to repeat an operation upon the same tumor inside of a year, although there can be no objection to doing so, after the effects of the previous operation have disappeared, say in two or three weeks.

By way of summary it may be said, that if the following points receive careful attention, relief, more or less complete, is pretty certain to follow this operation; a relief that in some cases will result in a permanent cure.

1. Inject only *internal* piles.
2. The solution of carbolic acid should not exceed ten per cent.
3. Do not repeat the operation under a week.
4. Inject only one or two minims into each tumor.
5. Inject not more than two piles at any one time.
6. Promise relief only, and not a radical or a permanent cure.

VI.

HERNIA EPIGASTRICA AND FATTY TUMORS IN THE EPIGASTRIUM.

BY HOWARD A. LOTHROP, M.D.

IN a previous paper* the subject of epigastric hernia was discussed in various phases, which will not be considered here in detail. The object of this communication is to present the results of further study of clinical phenomena and of anatomical dissections. Particular attention will be given to the consideration of the formation and clinical importance of the so-called "fatty tumors in the epigastrium and linea alba" and their relation to true herniæ in the epigastrium (Hernia epigastrica).

This paper is based upon the results of observation of 35 cases, which include fatty tumors and true herniæ in this region and the dissection of 17 anatomical specimens obtained at the Harvard Medical School. The subjoined cases have been selected so as to show as many different conditions as possible, and only their most salient points will be mentioned.

The cases are as follows: —

Case I. Epigastric and Umbilical Herniæ. Rachitis. Adenoids. — This patient was an infant, 4 months old, which was brought to the clinic of Dr. John Lovett Morse at the Infants' Hospital, and to him I am indebted for these notes. This was a healthy baby at birth, weighing 8 pounds, but it has never thrived. The baby refused to nurse and had been fed on condensed milk and proprietary foods. There has been much vomiting together with diarrhœa alternating with constipation.

Examination shows signs of well-marked rachitis and the presence of adenoids. The adenoids and enlarged tonsils interfere much with respiration. At the umbilicus is a small congenital umbilical hernia, which is reducible. Half way between the ensiform cartilage

* Boston Medical and Surgical Journal, February and March, 1897.

and the umbilicus is a second tumor situated in the median line, which is apparently reducible. This does not appear to be tender or to give rise to any symptoms whatever. Both of these herniæ were reduced and retained with plaster strips and swathe. Under the influence of careful feeding the general condition of the infant has improved much, and no further treatment has been directed for the herniæ.

Case II. Tumor in Epigastrium. Asthma. — This is the case of a man, 66 years of age, a laborer. Previous health had been good until last year, when he began to complain of dyspnœa, particularly on exertion. He had some cough, but no vomiting or gastro-intestinal disturbance, and fair appetite.

Examination showed the presence of chronic bronchitis and asthma, with dilated heart. In the epigastric area about 5 cm. above the umbilicus in the median line is a tumor about the size of a ten-cent piece, which is irreducible. It is not tender, and there is slight impulse on cough. He was not aware of its presence and there are no symptoms which could be referred to this swelling. This patient has been treated for his heart and lung complications with improvement. The tumor in the epigastrium is probably a fatty tumor derived from properitoneal fat.

Case III. Tumor in Epigastrium. Chronic Valvular Heart Disease. (Fig. VII.) — This case was seen in consultation with Dr. E. G. West. He was a man, 50 years of age, who had been struck on the back by a heavy gate. About sixteen months after this injury Dr. West discovered a swelling in the epigastrium, mid-way between the ensiform cartilage and the umbilicus. At that time he was suffering from moderate gastro-intestinal disturbance and had lost 40 pounds since his injury. This tumor was about the size of a ten-cent piece, was tender on pressure, and could be reduced so far as external appearances were concerned. There were no other herniæ present. His gastric disturbance was not constant, but would come at intervals of several days, lasting a few days at a time. This man preferred palliative treatment, which has been continued, and at present there is but little disturbance referred to the stomach, and his general health has improved.

Case IV. Tumor in Epigastrium. Colitis. — This patient was a girl, 4 years and 4 months old. For the last two years she had suffered from repeated attacks of diarrhœa, each lasting about two months. These had been getting worse of late. There have been five or six watery discharges daily, attended by occasional pain referred to the epigastrium, which was relieved by movement. Much gas in intestines — no nausea — no vomiting — appetite good — plays naturally — sleeps well at night.

Physical examination shows the child to be well developed and well nourished. In the epigastrium, about 5 cm. above the umbilicus

and a little to the right of the median line, is a swelling about the size of a 25-cent piece. This can be reduced so that an opening about 5 mm. in diameter can be felt with the finger tip. This patient was seen only once.

Case V. Tumor in Epigastrium. — This patient was a gardener, 30 years old. Prior to the last six months he had enjoyed good health. Since that time he observed a swelling above the umbilicus, which appeared without known cause. At this time he began to suffer from attacks of burning pain in epigastrium, attended by severe vomiting, coming on two or three hours after eating. In the last two weeks five or six attacks have been very severe. At times there is severe pain without vomiting, lasting about an hour after meals. The bowels have been regular, and he has lost about 10 pounds.

Physical examination shows a tumor about 8 mm. in diameter, situated in the median line, about 2.5 cm. above the umbilicus. There is a slight impulse on cough, and this tumor can be reduced. This patient was operated, and the tumor was found to consist of a small mass of fat, connected with properitoneal fat by a narrow neck passing through a small transverse oval opening in the aponeuroses of the abdominal muscles, close to the median line. A small portion of peritoneum was continued into this mass of fat. The abdominal cavity was not opened; the tumor was pulled outward and ligated, and the narrow slit in the aponeuroses closed transversely. In the course of two months all symptoms had disappeared.

Case VI. Tumor in Epigastrium. Probable Carcinoma of Stomach. — This patient was a musician, 67 years old. For the last 30 years he has complained of dyspepsia of considerable severity. About 30 years ago he had syphilis. For the last year his gastric disturbances have been much worse. Three or four hours after eating he has suffered much gastric pain and distress, lasting several hours. Much nausea; eructation of gas and liquid; much constipation, and some loss of weight.

Examination shows that he is only fairly nourished. About 5 cm. below the xiphoid process is a tumor about the size of a 10-cent piece. There is marked impulse on cough, and the tumor is irreducible. It is not tender, and he was not aware of its presence. He has never vomited blood. This patient is still under observation. The tumor in the epigastrium is probably one of properitoneal fat, and the symptoms and gastric analysis are suggestive of gastric carcinoma.

Case VII. Hernia Epigastrica. — (Fig. VIII.) This case was seen in consultation with Dr. West. He was a carpenter, 48 years of age. He had always enjoyed good health prior to an accident, whereby he was thrown against a door, striking his abdomen. In his effort to save himself from falling he experienced sudden pain

referred to the epigastrium. He was carried home, and nausea and vomiting were early symptoms. Since that time he has complained much of nausea and vomiting, and local pain, coming on particularly after meals. One year after accident a tumor was discovered in the epigastrium. This tumor was entirely reducible, and was about 7 mm. in diameter, while the ring was about 4 mm. As a result of straining or moving about this tumor could be made to reappear readily. This hernia has been kept back by means of a swathe, with a carefully adjusted pad, attended by relief of symptoms.

Case VIII. Epigastric Hernia. — This case occurred in the practice of Dr. E. B. Young. It was a laborer, 57 years old, and he sought medical advice on account of an attack of acute intestinal catarrh. He has always enjoyed good health previously, and was soon relieved of this attack, and has continued to remain well. By chance there was discovered in the centre of the epigastrium a hernia, which was entirely reducible. The ring was the size of a 50-cent piece, and circular, with smooth, rounded edges. The tumor itself could be made as large as the fist. The patient stated that he had had this tumor as long as he could remember, and could give no cause for its origin. He said it never caused him any trouble whatever, and, consequently, it had never been treated.

Case IX. Tumor in Epigastrium. Floating Kidney. Chronic Gastric Catarrh. — This woman came to the Out-Patient Department, in the service of Dr. Morse. She had complained of gastric symptoms for the last 10 years, coming on periodically. They are attended by much gas formation, vomiting, headache and dizziness, together with loss of appetite and general debility. Constipated.

Examination shows that she is fairly developed and fairly nourished, but rather delicate in appearance. The abdomen is prominent. About 8 mm. above the umbilicus is a small tumor, which was irreducible. It is not the cause of any local symptoms. The right kidney is freely movable. The capacity of the stomach was found not to be increased. She has continued under medical treatment, with some improvement. The condition in the epigastrium remains unchanged.

Case X. Tumor in Epigastrium. Left Inguinal Hernia. — This patient was examined in consequence of his having been thrown from a car. Previous to this injury he had fallen 33 feet into a well about 30 years ago, and 6 years ago he had been thrown a considerable distance over a pile of stones. For several years prior to this last accident he had suffered considerable gastric disturbance after eating, and frequently had been accustomed to produce vomiting by putting his finger into his throat, for he had found out that he could be relieved thereby of his nausea and pain.

Examination shows that he is well developed and fairly nourished. He is a laborer, 66 years old and weighs 177 pounds. Examination

shows, furthermore, a tumor half-way between the ensiform cartilage and the umbilicus about the size of a 25-cent piece, which can be partially reduced, and a small transverse ring detected. There is marked impulse on cough, and the region is slightly tender. He states that he has had this swelling in the epigastrium as long as he can remember, and he never knew that it troubled him. In the left groin is an inguinal hernia of large size.

Case XI. Epigastric Hernia. — This patient was operated by Dr. J. B. Blake on the service of Dr. Gay. He was 40 years of age, and always had enjoyed good health. For the last year he had noticed a small swelling to the right and just above the umbilicus. It had never given him any discomfort, whatever, and had not increased particularly of late. On the day of entering the hospital, during a fit of coughing, he felt something "give way" in the vicinity of this tumor and experienced a sudden pain and observed that the tumor was larger and very tender. He vomited and had a chill.

Examination showed a tumor the size of the fist, moderately elevated above the surface of the abdominal wall and situated just to the right and above the umbilicus. It was hard, tender and slightly tympanitic. It could not be reduced in size by taxis. A vertical incision was made over this tumor, and a sac exposed which contained a mass of omentum partly strangulated and very adherent to the wall of sac. The adhesions were broken down and omentum reduced. Careful dissection showed that there was an opening through the substance of the rectus muscle to the right and above the umbilicus. The ring was 5 cm. in diameter. The sac was ligated, and the wound closed.

Case XII. Strangulated Umbilical Hernia. Epigastric Hernia. — This patient was operated by Dr. Lund. She was a woman, 54 years of age, well developed and nourished. She had had an umbilical hernia for four years, which had given her no trouble until the day of operation, when she entered the hospital on account of acute symptoms due to strangulated omentum. The umbilical hernia was as large as two fists, and contained omentum and a coil of transverse colon 18 cm. long. This hernia was operated in the usual way. During the course of the operation a second tumor was discovered, the ring of which was 2.5 cm. above that of the umbilical hernia. This contained a portion of omentum as large as an English walnut. The opening of this ring was 6 mm. in diameter, and this hernia was irreducible. The structures were carefully exposed, the omentum freed, the sac tied off and the opening in the aponeurosis closed. Patient made an uneventful recovery.

Case XIII. Epigastric Hernia. Neurasthenia. — This patient was a large Italian woman, who had suffered from epigastric hernia for ten years. She does not know any cause for its origin or just when it appeared first. It caused her very little trouble at first, but in the

last few months she has had much gastric disturbance, particularly after eating.

Examination shows a woman well developed and well nourished. She complains of much gastric disturbance in addition to headache, sleeplessness, excitability, restlessness and obscure general pains. She was very anxious about herself, although she admitted that the size of the tumor and the gastric disturbance had not changed perceptibly during the last two or three years. In the epigastrium, midway between the ensiform cartilage and the umbilicus, is a reducible epigastric hernia. The ring is rounded and smooth and about 5 cm. in diameter, through which the skin can be well inverted into the abdomen. When standing or on coughing this tumor is larger than the fist. The local tenderness is only moderate. Although there is every indication for operation the patient refused such treatment.

Case XIV. (See Fig. IX.) *Hernia Epigastrica. Inguinal Hernia.* — This was a man, 59 years of age, a laborer, who came to the Out-Patient Department in consequence of having sustained a contusion of back. In the course of the examination he was found to be suffering from large epigastric and inguinal herniæ. He said both of them had been present for a long while, and he never knew any definite cause. The tumor in the epigastrium had never caused him any disturbance, and he was loathe to have me examine it, for he said it did not trouble him. This tumor was situated in the median line, caused no subjective symptoms and was partially reducible. It was about 7.5 cm. in diameter and the ring would admit easily three fingers. It had never been treated and was apparently the source of no discomfort.

Case XV. Epigastric hernia following immediately after trauma. — This man was brought to the hospital, having been struck in the abdomen by the pole of a wagon. He suffered much from shock and general abdominal pain. There was moderate ecchymosis above and to left of umbilicus, but the skin was intact. The abdomen was not distended. There was no vomiting, and there were no symptoms suggesting severe injury. He was put to bed. In the course of an hour there was increased pain in abdomen with beginning distention. When he raised his head or strained there was moderate prominence to the left and above umbilicus and palpation detected an injury to the muscles of the abdominal wall. There was some bulging of the peritoneum in consequence of the extra abdominal pressure forcing the intestines forward. This was a traumatic hernia. The patient was operated, and it was found that the force of the accident had been sufficient to rupture a coil of small intestine. Patient died subsequently from peritonitis.

Case XVI. (Fig. VI.) *Strangulated epigastric hernia. Umbilical hernia.* — This patient was a woman of medium height and obese.

She was 37 years old and had had ten children. Had always enjoyed good health. For last twelve years she has had a swelling in the epigastrium, and also at umbilicus, but she denies that either of these swellings has ever caused her any discomfort. There is no history of any gastric disturbance. She was seen 24 hours after the sudden onset of acute abdominal symptoms which consisted of nausea, vomiting and general abdominal pain gradually becoming localized in the epigastrium. This epigastric swelling had increased somewhat in size, and was beginning to be very tender. There was much spasm of abdominal muscles. At the umbilicus was an umbilical hernia 4 cm. in diameter and elevated about 2.5 cm. above the level of the skin. This was irreducible, and there was impulse on cough. It was not the source of any discomfort. Above the umbilicus in the lower portion of the epigastrium was a softened circular swelling 10 cm. in diameter. The underlying skin was reddened in consequence of fomentations which had been applied. The mass was firm, tender and slightly dull on percussion with considerable impulse on cough. It was movable, edges of tumor were not sharply defined, and the impulse on cough was plainly visible.

A median vertical incision about 11 cm. long was made over the tumor the lower end of which came nearly to the umbilicus. Abdominal fat was about 2.5 cm. thick. This was retracted and the tumor mass exposed, which was contained within a sac about 10 cm. in diameter. This mass was yellow and lobulated. The sac was divided vertically exposing fat 6 mm. to 2.5 cm. thick rather uniformly distributed over the inner, more dense mass. This layer of fat was lighter yellow, but contained fewer fibrous tuberculae than the subcutaneous fat. This fatty layer was excised vertically and retracted in different directions from the sac, exposing a rounded tumor mass which was smooth, tense and a dark reddish brown color contained within a dense membrane. On incision, this membrane was comparatively thick and well formed. There escaped 30 cc. of thin hemorrhagic fluid with a few clots of blood. Within this sac was a coil of small intestine about 7.5 cm. long which was strangulated and held firmly in a ring 2.5 cm. in diameter. The serous surface of the intestine was still shiny, and several clots of blood were pulled off. The intestine was dark red, but the color faded quickly when the ring was enlarged in a vertical direction. This deep sac enclosing bowel was found to consist of peritoneum and the fascia transversalis. The fatty layer next outside this inner sac was continuous with the thick layer of fat which could be traced in all directions from the circumference of the ring extending between the fascia transversalis and the aponeurosis of transverse muscle. This fat was uniformly 1.3 cm. thick and above it could be traced between the peritoneal surfaces of the falciform ligament of the liver. This

fatty layer, therefore, was a portion of the properitoneal fat which had been forced out through the ring in the aponeuroses of the abdominal muscles. Its fibrous covering was derived in part from a portion of the fascia transversalis and the deeper subcutaneous fascia of the abdominal wall. This sac was thinner at the apex than at the ring. The aponeurosis of the external oblique muscle was exposed clearly at the circumference of the ring. The ring itself was oval and placed in the linea alba about in the median line, but its long diameter was transverse. It was situated about 7.5 cm. above the umbilicus. The outer sac and properitoneal fat were removed close to the circumference of the ring. The inner sac was pulled forward and litigated as deeply as possible. The only contents of this hernial sac was this coil of small intestine which was reduced. The edges of the ring were approximated, and made to overlap on a horizontal plane and held in apposition by five interrupted kangaroo tendon sutures, one of which was a mattress suture. The incision in the skin was united with silk-worm gut. The small omental tumor was not disturbed on account of the exigencies of the case. Patient made an uninterrupted convalescence.

Anatomical Specimens. — All the specimens were obtained in the dissecting room, and nothing is known of their clinical history. The number of specimens was 17. In 15 there were single tumors, and in 2 specimens there were two and three tumors of fat respectively. In 16 the fat was connected directly with the properitoneal fat, and in one there was a distinct and separate fatty tumor, 7 x 4 cm. in measurement, and placed vertically along the linea alba in the subcutaneous tissue. Before dissection it gave every appearance of a hernia epigastrica. These tumors were usually oval or circular and always lobulated. Occasionally, they were much elongated, clubbed at the extremity and having a very narrow neck. The size varies from 5 mm. to 6 cm. in diameter. The smaller ones could be reduced through the ring causing a tumor on the peritoneal side covered by peritoneum (Fig. V). Most of the fatty tumors were about the size of the tip of the fifth finger. The usual location was the linea alba, more commonly toward the umbilicus. When examined more carefully it could be seen that they arose just to one side or the other of the linea alba, and as the ring became larger it assumed a more median position. The ring in the aponeurosis appears as a small transverse slit as determined

by the arrangement of the fibres which compose the aponeuroses of the abdominal muscles. In almost every instance this opening is associated with small vessels and nerves. (Fig. I., II., III.) In several instances these fatty tumors were complicated by the presence of inguinal, femoral or umbilical herniæ. The amount of subcutaneous fat layer varies within wide limits. The properitoneal fat was sometimes in a layer 1 cm. thick and evenly distributed, but in other instances it was limited to the region of the linea alba.

These tumors of properitoneal fat were always covered with a delicate layer of connective tissue forming a sac which was derived from the deep layer of subcutaneous fascia blended with a delicate layer derived from the fascia transversalis. In nearly every instance vessels of different size and nerves were associated with this sac, and passed through the ring in the aponeuroses. In some instances fat was forced through the thin rectus abdominis muscle following the course of vessels. As seen in Figs. I., II., III., the openings in the aponeuroses for vessels vary in size, and here and there are open slits where parallel fibres had become separated, exposing the vertical fibres of the rectus muscle. In none of these specimens were there either omentum or bowel in the sac at time of inspection. In most cases the peritoneum was perfectly smooth behind the tumor, but when the tumor was pulled forward the result invariably was that the peritoneum could be drawn through the ring. Dissection showed that the mass of fat was closely connected with the peritoneum by fibrous bands. In other cases pockets of peritoneum had been formed; and these extended through the ring. Into this depression omentum could be forced. The size of the pocket of peritoneum had no relation to the size of properitoneal fat. The fat was usually distributed irregularly.

General Considerations. — By the term *hernia* we mean the protrusion of a portion of the abdominal contents through an opening in the abdominal parietes. By the term *hernia epigastrica*, we mean the protrusion of one or more of the abdominal viscera through the abdominal wall in the region of the epigastrium. This area is usually bounded by the xiphoid cartilage and the free borders of the cartilages of the

ribs above and laterally, and extending as low as the level of the umbilicus. In this area are included the broad portion of the lineae alba, the lineae semilunares and the lineae transversae of the rectus muscle. At the umbilicus and in the femoral and inguinal regions are preformed openings where the abdominal wall is naturally weakened. Herniæ in these regions make their appearance in these weakened places. In the epigastrium there are no such preformed openings of much apparent importance, but under certain conditions the openings ordinarily occupied by small vessels and nerves become much dilated, and are the usual site of epigastric hernia.

An understanding of the anatomical and clinical features of epigastric herniæ and fatty tumors in this vicinity is of great importance in medical clinics, particularly in reference to diseases referred to the abdominal viscera. Many of the most troublesome cases of such hernia appear in medical clinics, and the symptoms are referred to the gastro-intestinal tract. They may appear at a time when objective signs are few and easily overlooked unless particular examination is made.

Compared with the occurrence of all other herniæ, those in the epigastrium are not common. In a series of 18,000 cases of all herniæ, 145 were of the variety known as hernia epigastrica. They are usually single, but occasionally there may be two or even three present at the same time. It is not unusual to find one true hernia associated with a protrusion of properitoneal fat which does not contain sufficient sac to allow of the escape of omentum into it. This may be a forerunner, however, of a second true hernia. It may remain stationary and never develop into such hernia. It is not uncommon to find these fatty tumors and herniæ associated with herniæ in other regions. The condition known as "hernia disposition" applies equally to epigastric herniæ. It is found that this variety of hernia is rather peculiar to adult life, and that the great majority of cases are observed in patients over 30 years of age. In reviewing the different cases it will be seen that one patient was afflicted at the age of four months (Case I). This condition occurs much more commonly in males, and particularly in the working class.

They do not seem to be more common, however, in obese than in poorly nourished individuals.

Etiology. — As described previously, there are four general groups into which these cases may be classified from an etiological point of view.

I. Embryological Defect. In very rare instances there may be a failure of the abdominal parietes to close in the median line so that weakened points may remain through which abdominal viscera may protude in the epigastric area.

II. Weak Abdominal Parietes. In certain instances the abdominal walls may be so thin in consequence of atrophy that portions appear to protrude more than others whenever abdominal pressure is increased. The recti muscles may be thinned, and their internal borders so separated that there would seem to be a localized bulging along the linea alba. This is more apparent when there is much loss of fat tissue. It is possible for certain areas to become thinner than others so that increased abdominal pressure causes these places to yield and eventually to form pockets into which omentum or bowel may be forced. This is probably a very unusual cause for the origin of these tumors.

III. Trauma. There are undoubted cases where trauma has been the direct cause of epigastric hernia. There is a growing feeling among surgeons that trauma is less of a direct factor in the causation of herniæ in general than was previously entertained. Herniæ are looked upon more and more as a result of some pathological process of gradual development whereby the parts become thinned and weakened and consequently stretch, thus allowing the abdominal viscera to escape gradually through the abdominal parietes. Whenever the abdominal pressure is increased in consequence of any trauma, these weakened spots can be stretched so that a hernia may appear for the first time soon after such trauma, or a pre-existing hernia may be enlarged. It is common to find in the inguinal region a well-developed hernia on one side, but no sign of hernia on the other, although the rings may be large and the tissues thin. The term "hernia disposition" refers to this condition, although there may be no actual hernia formation.

On the other hand, the undoubted cases where trauma has been the direct cause of hernia in the epigastric region have been cases of comparatively severe injury. For example, in Case XV. the patient was struck in the abdomen by a pole. The skin and peritoneum remained intact, but the abdominal muscles were ruptured so that soon after injury there was hernial protrusion. Other recorded cases of trauma which have been the undoubted cause of epigastric herniæ have also been severe, and attended by early subjective and objective symptoms.

IV. The Influence of Properitoneal Fat and Terminal Vessels and Nerves in the Causation of Hernia in the Epigastrium. There is but little question that fatty tumors and epigastric herniæ are usually of slow origin, and are developed at points where the vessels pass forward through the anterior sheath of the rectus muscle, particularly in the vicinity of the linea alba. The various steps in this process can be demonstrated on the specimens dissected, and is seen frequently at operations. The essential points will be described under pathological anatomy.

In order to understand the conditions which favor the development of these herniæ one must be familiar with the normal anatomy of the epigastric region. In that this anatomy has been described previously in some detail, suffice it merely to mention the structures which must be understood, such as, the arrangement of the sheaths of the rectus muscle and the formation by the fibres of the aponeuroses of the broad abdominal muscles of rhomboid meshes; the formation of the linea alba, lineæ semilunares, lineæ transversæ, the round ligament, the falciform ligament containing the obliterated umbilical vein and parumbilical veins which may persist as vessels of some magnitude, the openings observed in the aponeurosis of the external oblique muscle for the passage of vessels and nerves; occasional slits between the fibres of these aponeuroses as shown in Figs. I., II. and III.; the presence of properitoneal fat and its distribution. The association between the fibres of the spinal nerves which pass through these openings with the sympathetic system, which in turn supplies the stomach and intestines through the

epigastric plexus, must be understood in order to explain the stomach symptoms which are sometimes associated with these apparently simple fatty tumors. Such normal anatomy will not be reconsidered here.

Pathological Anatomy. Method of Origin of Fatty Tumors and Their Relation to Herniæ in the Epigastrium. — At one or more points the abdominal wall becomes weakened and less able to withstand increased abdominal pressure. The points generally correspond to the site of passage of vessels through the anterior sheath of the rectus muscle or the immediate vicinity of the linea alba. Prolonged tension and atrophy of tissue in these areas furnish small openings in this sheath through which a small portion of properitoneal fat is forced. This is a slow process, but when once established it tends to progress until a small mass of fat has appeared external to the aponeurosis. There may or may not be a portion of peritoneum pulled forward by the fibrous tissue which connects the fat and peritoneum. Thus we have the formation of a fatty tumor which has many of the characteristics of a hernia, and may be the forerunner of such a condition. Such a tumor may be reduced through the ring, or this external mass of fat may be augmented and connected with deeper fat only by a narrow neck, and thus become irreducible. The size of these tumors varies, but they are usually small. It is probable that properitoneal fat is of much importance in the formation of herniæ in any part of the abdominal wall. These tumors are probably constant when once formed. They may remain unchanged or may aid in the formation of a true hernia.

It is probable that most epigastric herniæ are preceded by a condition which, at one time, could be considered only as a fatty tumor, such as has just been described. In time this mass may pull forward a pocket of peritoneum into which omentum may enter, or an increased abdominal pressure may serve to increase this depression. Thus, omentum, and eventually intestine, may be forced through the abdominal wall and true hernia formed thereby. Original depressions, or pockets, in the peritoneum are not sufficient to give rise to hernia. The essential feature is a giving way of muscles

and fasciae of the abdominal walls. The mass of properitoneal fat covering such a hernia may be slight or considerable. A hernia formed thus would be covered by the following layers, which were demonstrated well in Case XVI., Fig. VI.: Skin, superficial fascia containing subcutaneous fat, deep fascia, properitoneal fat, fascia transversalis and peritoneum. It is very probable that many of the so-called umbilical herniæ developed subsequently in consequence of fatty tumors which have appeared near the umbilicus.

Symptoms. — The symptoms, which may be caused either by fatty tumors or epigastric herniæ, are classified, as in a previous paper, for descriptive purposes, into three groups, namely: (1) Presence of a tumor, which gives rise to no disturbance whatever; (2) Symptoms attending the presence of a tumor in consequence of trauma; (3) The insidious and progressive variety. This latter group includes most of the cases.

Fatty Tumors. — Fatty tumors in this area are comparatively common and most of them tend to cause no disturbance whatever. As a rule they are discovered by accident, but occasionally the patient is aware of their presence when not too small. No recorded cases have been found where a single properitoneal mass of fat has appeared directly in consequence of trauma. That such could be possible is demonstrated by the presence of small masses of fat in the dissecting-room, when by chance the aponeurosis is nicked here and there, in consequence of which the internal pressure is sufficient to force through a small mass of fat. It sometimes happens, on the other hand, that these small fatty tumors are the source of more or less disturbance, occasionally causing severe symptoms. These symptoms do not differ in any respect from those caused by the smaller epigastric herniæ, and they will be considered under that group. These tumors can be detected usually by careful examination. Most of them are irreducible as a result of ordinary pressure, but occasionally they can be reduced readily, and this can be accomplished more frequently when considerable force is used. As has been demonstrated on

the specimens, such reduction consists in simply pushing the tumor back through the ring and making a corresponding swelling on the peritoneal side. It is practically a "reduction en bloc." Pain associated with these tumors may be due either to muscular contraction, which pulls on the mass, or to pressure on the nerve filaments.

Epigastric Herniæ. — It is very common for the herniæ to be present without causing any subjective symptoms whatever, notwithstanding the size of the tumor present, as demonstrated by many cases. The patient may be aware of the presence of such tumor or it may be discovered in a routine examination.

As a direct result of trauma, these herniæ are rare. As has been noted above, the trauma must be sufficient to rupture directly the abdominal wall. Such injury is usually attended with considerable violence, and is usually in the nature of a blow by some comparatively sharp object. In certain instances, unusual vertical strain may tend to separate the oblique fibres of the aponeurosis, giving rise to a small transverse tear. In these cases, in addition to the constitutional effects of such injury, there is usually local pain. The hernia appears whenever the abdominal pressure is increased, while lying or standing. In addition to the local pain and tenderness there is frequently nausea and vomiting.

The common type of epigastric hernia is one of insidious origin, attended by more or less gastro-intestinal disturbance with or without local pain. It is this variety that is apt to visit the medical clinic on account of some gastric disturbance, which should invariably make one suspicious of the presence of a small fatty tumor or an epigastric hernia. It is a good rule to examine the epigastrium for this condition as a routine procedure. The symptoms referred to the stomach may be nausea, vomiting, increased acidity, eructations, and occasionally palpitation whenever an increased gas formation embarrasses the action of the heart. The motile power of the stomach may be interfered with. Pain is commonly present. All of these symptoms usually follow a meal, and are sometimes worse in proportion to the amount

rather than the nature of the ingesta. Intestinal indigestion may be a sequence. The pain is sometimes spasmodic so that these gastric disturbances are known as "crises." An explanation of the presence of these symptoms in cases of simply fatty tumors is somewhat theoretical. It is supposed to be due to the intimate connection between the intercostal nerves and the sympathetic system which is anatomically well established. In cases of true herniæ, however, this same supposition may hold good, but a more probable explanation in these cases is the pull of the omentum, which becomes frequently irreducible, so that the changing positition of the stomach when full or empty exerts more or less traction, hence patients learn that they are more comfortable when they take small amounts of ingesta frequently than when they have overloaded their stomachs. They have learned that vomiting produces relief.

Tenderness may be present or absent in any of these cases. Most of them are a little tender if sufficient pressure is exerted. The tenderness is, on the one hand, local over the tumor itself or it may be referred to the deeper structures so that sometimes there is a tender area to the left of the linea alba just below the xiphoid cartilage. This is supposed to be due to the sensitive condition of the sympathetic plexus. In rare instances the patient may be so obese and the tumor so small that it cannot be palpated. Usually, however, careful examination will reveal its presence.

These tumors are small as a rule, and commonly are not larger than an English walnut. At times they may have a diameter of 4 to 7 cm., while Mongie reports a case where the tumor was the size of the head of a fœtus at term and occupied the whole epigastric area. This is a most unusual case. These tumors are always lobulated, but this fact is difficult to determine by palpation. There is almost always some impulse on cough. As a rule, a certain portion of the tumor can be reduced. The patient should be examined in different positions, standing, lying on the back, lying on the abdomen, also with the abdominal muscles lax and during tension of such muscles, which is best carried out with the patient lying on the back having his head and shoulders

raised. This makes the recti muscles tense and any tumor, even when small can usually be detected. The common viscus present in the hernial sac is omentum and this may be adherent either within the sac or in the vicinity of the ring. Unless the sac is large the intestine is an unusual complication. Such an incarcerated omentum becomes strangulated readily as in the umbilical variety. The tranverse colon has been very rarely observed, but a loop of small intestine is the usual portion of the intestine which finds its way into the sac. At one time these herniæ were called "gastrocele," but there are no authentic cases where a portion of the stomach has been found in the sac. Only two cases of strangulated bowel have been found recorded in literature, so that Case XVI. is one of great rarity.

As an end result in certain cases where gastro-intestinal disturbance is considerable and prolonged, the nutrition of the individual becomes impaired, the patient loses strength and weight and becomes anæmic. Whenever these cases are accompanied by much pain and tenderness in addition to the gastric disturbance, nervous disorders of a neurasthenic type may develop. Occasionally the condition may have lasted so long that the patient fails to recuperate even after the cause has been removed.

Diagnosis. — If one is on the lookout for these cases in the course of an examination they will usually be discovered. This condition should be thought of in all cases where the symptoms, whether subjective or objective, are referred to the stomach or intestines or to a tumor of any sort in the epigastrium. Suffice it at this time merely to mention the conditions which might arise for differential diagnosis whenever symptoms are referred to this region, — namely: all diseases of the stomach, pain referred to the epigastrium and vicinity as suggesting, furthermore, biliary calculus, inflammation of the gall bladder, renal calculus, ulcers of the duodenum, diseases of pancreas. Tumors in this vicinity should suggest fatty tumors limited to the subcutaneous tissue and tumors in the vicinity of the umbilicus, such as gumma, carcinoma, sarcoma, cysts of urachus, hydatid cysts, dermoid cysts and fibroma associated with the terminations of nerves. Caries

of the lower end of the sternum or intercostal cartilages may be attended by small pus collections which resemble these herniæ.

Prognosis. — When a fatty tumor or epigastric hernia has become well established, it will not disappear spontaneously. It may never cause any trouble or it may give rise to symptoms at any time. The discomfort may be moderate or severe, irrespective of objective symptoms. One of the dissected specimens showed that the sac had become shut off at the plane of the peritoneal surface of the abdominal wall and a fatty tumor remained, which contained the obliterated sac. A fatty tumor, or hernia, may remain undiscovered and continue to cause discomfort. Such patients are treated for some disease of the stomach. In severe cases, conditions due to malnutrition may follow. In rare instances the patient becomes a hopeless invalid.

Treatment. — If the hernia causes no trouble, no treatment is indicated, for it may never be the source of any annoyance. If symptoms are present, operation offers the only means of certain relief, and this measure should be suggested, provided there are no complications which would contraindicate surgical intervention. Trusses and swathes do not retain the herniæ satisfactorily after reduction, and such treatment only aggravates the condition where the tumor is irreducible. In extreme cases of local pain without objective signs where a hernia is suspected, an exploratory operation is justified. It is very important to free the omentum from all adhesions. As a rule, operative treatment brings early relief with a minumun of risk. Recurrence is unusual. The general principles made use of in the relief of umbilical hernia are of value in the treatment of these cases and need not be considered at this time.

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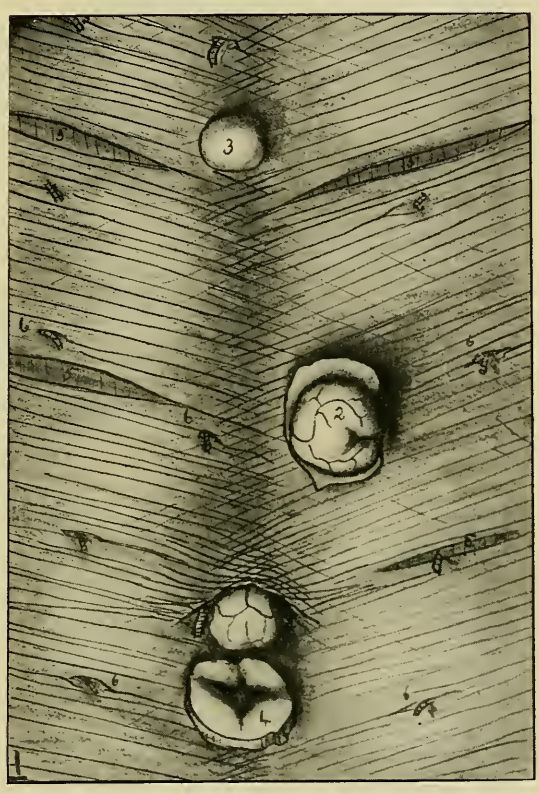

FIG. 1. — Aponeurosis of external oblique muscle exposed, showing three fatty tumors in the epigastric area. (1.) A mass of properitoneal fat about 6 mm. in diameter. It is closely connected with the peritoneum which is smooth posteriorly except when the tumor is pulled forward causing a puckered depression. (2.) A mass of properitoneal fat 18 by 10 mm. in diameter which was covered by a delicate sac which has been reflected and is made up in part of the fascia transversalis blended with a thin layer which covers the external oblique aponeurosis. Peritoneum passes into this fat mass for a short distance. This tumor is 4 cm. above the umbilicus and 1.5 cm. to the left of the linea alba. The ring is oval and placed horizontally. (3.) This is a smaller tumor with its sac intact. It is 9 cm. above the umbilicus just to the right of the median line. Peritoneum posteriorily is smooth. (4.) Umbilicus. (5.) Slits in external oblique aponeurosis through which can be seen the verticle fibres of rectus abdominis muscle. (6.) Terminal branches of arteries, veins and nerves.

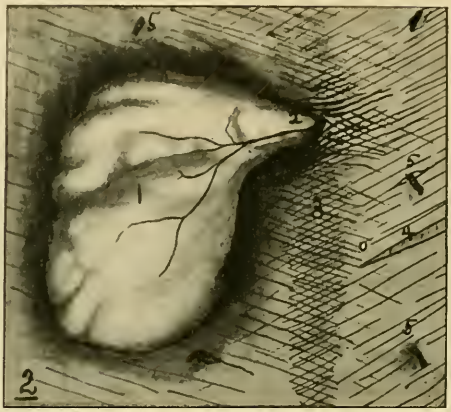

FIG. II.—(1.) A fatty tumor derived from properitoneal fat measuring 3.5 by 2.5 cm. It was lying well to the right of median line 6 cm. above umbilicus. Ring is just to the right of linea alba and measures transversely 4 mm. (2.) Constricted neck of tumor. The peritoneum is continued into this fatty tumor about 8 mm. forming a sac into which omentum could enter. (3.) Linea alba. (4.) Normal slit in aponeurosis of external oblique muscle. (5.) Vessels and nerves puncturing this aponeurosis.

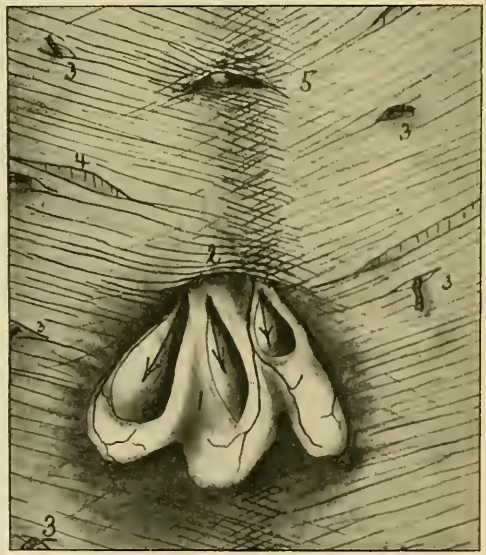

FIG III.—External oblique aponeurosis exposed showing (1) a lobed mass of fat derived from properitoneal fat coming through the ring, (2) 10 mm. wide and 6 mm. high which extends more to right of median line showing the separation of aponeurosis fibres. Ring is 5 cm. above umbilicus. From peritoneal side (see Fig. IV.) are three pockets where the peritoneum passes into this properitoneal fat forming three distinct sacs as indicated by arrows. A mass of omentum could enter this sac forming a true epigastric hernia. (3.) Vessels and nerves coming through aponeurosis. (4.) Natural slit in aponeurosis.

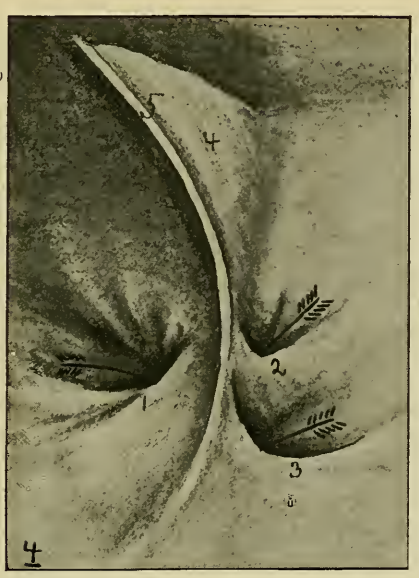

FIG. IV.—Peritoneal surface of previous specimen (Fig. III.), showing peritoneal depressions (1), (2), (3), made by an invaginated process of peritoneum which passed through the opening in the aponeurosis into the mass of properitoneal fat. (4.) Falciform ligament. (5.) Its free border containing round ligament.

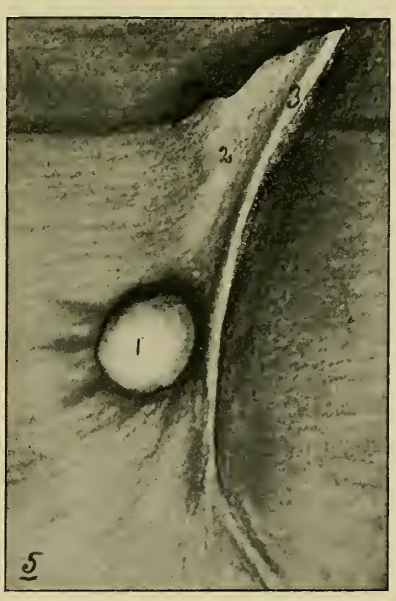

FIG. V.—Peritoneal surface of a specimen showing a tumor (1) which is a mass of properitoneal fat which has been pushed back artificially from before and apparently reduced. It is covered by peritoneum. It shows that these properitoneal fatty tumors can be easily reduced and readily mistaken for a true epigastric hernia. (2.) Falciform ligament. (3.) Round ligament in its free border.

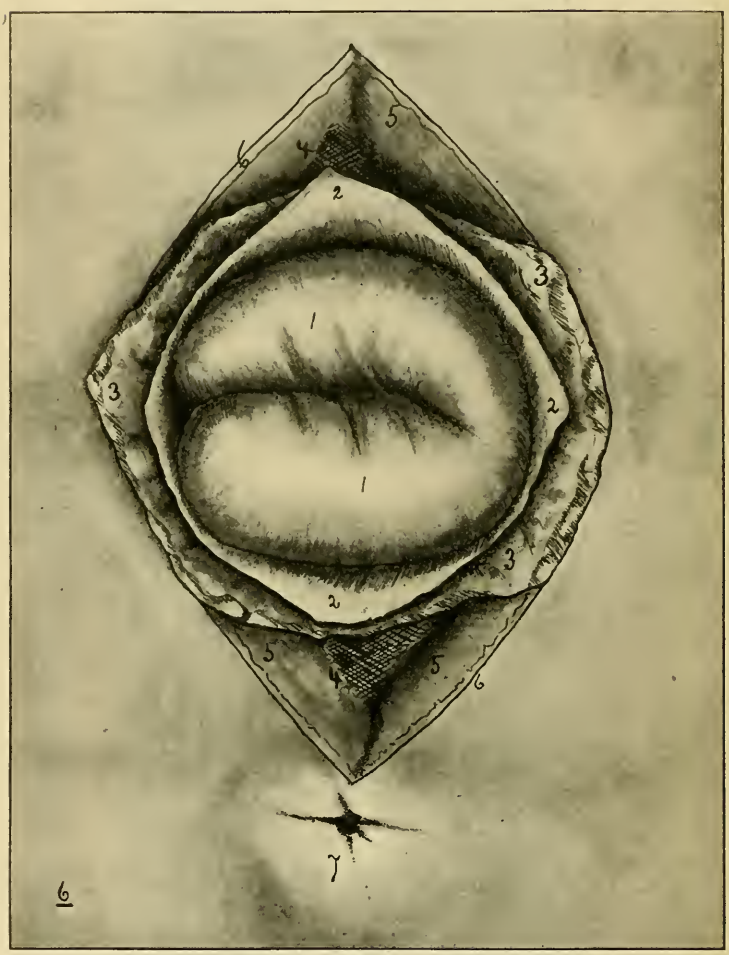

FIG. VI. — This figure demonstrates the pathological condition discovered at operation in Case XVI. (1.) Loop of small intestine contained within (2) which is the true sac of the strangulated epigastric hernia. (3.) Thick layer of properitoneal fat surrounded by delicate membrane of fibrous tissue. (4.) Oblique fibres of aponeurosis of external oblique muscle. (5.) Thick layer of subcutaneous fat. (6.) Skin. (7.) Prominence made by irreducible umbilical hernia.

FIG. VII. — Small tumor in epigastrium, probably properitoneal fat. Case III.

FIG. VIII. — Epigastric hernia. Case VII.

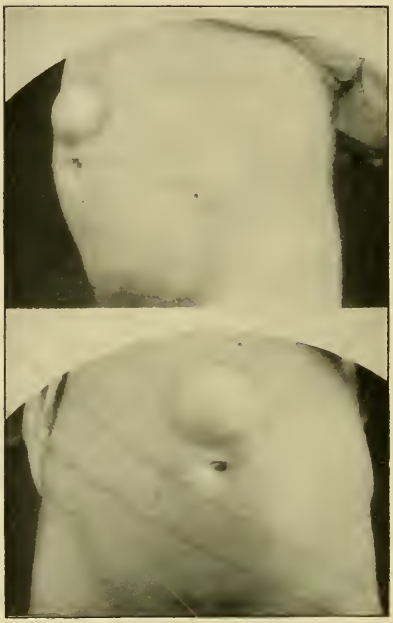

FIG. IX.—Epigastric hernia. Case XIV.

VII.

THE SIMILARITY OF THE EARLY SYMPTOMS OF SIMPLE ABDOMINAL CONTUSION AND ONE ACCOMPANIED BY SEVERE INTESTINAL INJURY. THE NEED OF EXPLORATORY CELIOTOMY AS AN EARLY ROUTINE MEASURE.

John T. Bottomley, M.D.

To the surgeon who has to deal with the emergencies of hospital practice, no class of cases may offer greater difficulty in deciding the question, "What shall I do here?" than injuries of the abdomen produced by blunt violence. For either operative treatment is entirely unnecessary or, to be of avail, is most urgently and speedily demanded. If the local effect of the injury is limited to the abdominal wall, very simple or no operative measures are to be considered; if, on the other hand, the underlying viscera have suffered, a capital operation becomes a necessity. The responsibility of deciding is weighty. No one cares to do a needless laparotomy; yet it is surely not desirable to sacrifice a life because of ones indecision or inactivity. Are there any signs, subjective or objective, that will indicate to us the proper course to pursue?

It is not the purpose of the writer to consider here injuries of the liver, spleen, kidneys or bladder, complicating contusions of the abdominal wall; these usually give more or less definite signs of their presence. Rather will he discuss the possibility of distinguishing between a simple uncomplicated contusion of the abdomen and one associated with injury to the underlying intestine.

It is not easy to collect reliable statistics in a number of such cases sufficient to warrant the drawing of conclusions. Hospital records, the written observations of many differ-

ent men, are often unsatisfactory; some cases are brought to the hospital immediately after an accident; others not for hours or even days. Very careful records are kept in some cases; scarcely any in others. And right here the writer wishes to make a plea for a careful recording of all the signs and symptoms in these cases and a particularly careful observation of their course especially for the first few hours — and they are the important ones — after the injury.

The writer has taken all the available cases, twenty in number, of undoubted severe intestinal injury caused by blunt violence (undoubted, because proven later by autopsy, operation or death from a rapid general peritonitis) and an equal number of cases of undoubted simple contusion of the abdominal wall (undoubted, because the symptoms disappeared in a comparatively few days and left the patient well). These latter were *chosen* cases only in that an attempt was to have the causes of the cases of simple contusion be as nearly identical as possible with those of the cases of intestinal injury. Only such cases of either class were considered as were admitted to the hospital immediately or very soon after the receival of the injury.

As far as the age of the patients is concerned, by far the great majority were adults. All but three of the cases of intestinal injury and all but four of the cases of simple contusion were nineteen years of age or over.

Causes. — The following table shows the various agents and the number of times each was active in either class of cases.

	Simple Abdominal Contusion.	Intestinal Injury.
Struck by a wagon shaft	3	4
Fall from various heights	3	2
Horse kick	5	4
Human kick	3	1
Run over by a team	2	1
Fallen on by objects	2	1
Struck by flying objects	0	4
Caught between moving and fixed bodies	2	2
Struck by a poker	0	1

Severe violence, well localized, is usually the important factor in the production of injury to the intestines and other

abdominal viscera: hence, a careful history of the accident itself should be obtained. Even then, as the table of causes indicates, it must be remembered that what are apparently identical (as far as we can judge) causes may produce either a comparatively unimportant or the most severe injury. It is equally difficult to measure the amount of force exerted by the acting agent and the power or lack of power of resistance on the part of the object. It is noteworthy in this connection that of seven cases of injury caused by being struck in the abdomen by the shaft of a wagon, only four resulted in injury to the intestine; in the three others a simple contusion of the abdominal wall followed. The injuries resulting from horse kicks tell a similar story. On the other hand, injuries caused by flying objects, such as pieces of board from circular saws, etc., seem very apt to be serious. It may be said that knowledge of the point of impact and as careful an estimation as possible of the amount of force exerted are very important.

Symptoms. — It is certainly true that people differ in their sensibilities. Similar injuries may cause profound shock in this patient, none or very slight in that; may be followed by the most intense pain in one patient, by only slight pain in another. It is probable, however, that in a series of cases these things even themselves up and deductions drawn therefrom can be safely applied in the average case.

Let us consider and compare the symptoms of these two series of cases. When we say symptoms, we mean here only those shown upon entrance to the hospital or immediately after. May we depend on any one symptom or combination of symptoms to indicate to us the correct diagnosis and consequently the correct treatment?

Pain. — Pain was present in all the cases of the more severe injury and in all but one of those of simple contusion. It is the most constant symptom, and while it is evidently of no particular diagnostic value, yet it may be the only symptom of a most serious injury. Manley reports such a case in which pain in the right groin was the only symptom of a complete rupture of the ileum. The pain may not be continuous; it may disappear and return again. Neither is its

severity always marked; shock, for instance, may deaden the patient's sensibility to pain. In six of each class of cases it was noted as severe. As to its being local or general, it was mentioned as local in two of the cases of intestinal injury and in one of the cases of contusion.

Vomiting. — This symptom was present in ten of each class of cases; it was absent in two cases of intestinal injury and in seven cases of simple contusion, and was not mentioned in eight cases of the former and three of the latter class. Of the ten cases of simple contusion in which it did not appear as a symptom at entrance, in four it appeared within the first twenty-four hours. Of the ten similar cases of the more severe injury, it appeared in six within twenty-four hours. So, while the presence of vomiting as an initial symptom is not of much diagnostic importance, its absence, while by no means conclusive, would incline us to think rather of the less severe form of injury. Its appearance late in or after the first twenty-four hours may be usually regarded as of serious import, and yet in one case of this series a 3,000-pound load of coal passed over the epigastric region of an adult and vomiting did not begin till after forty-eight hours had passed; beginning then, it continued for a number of hours, passed away and did not reappear. The patient recovered. The vomiting was his only serious symptom and his case was one of simple contusion. The symptom may continue for a while and cease even in cases that later prove fatal. Continuous vomiting is considered by some to point strongly to intestinal injury. While the records of the cases now under discussion tell but little on this point one case is perhaps worthy of mention in this regard. A carpenter fell from a ladder and struck on his abdomen across a board partition. He was brought to the hospital immediately, and vomited continuously for thirty-six hours and more or less for twelve hours longer. In addition he had severe abdominal pain, distention and muscular spasm and lay with flexed knees; yet in three days all symptoms had disappeared, and shortly afterwards he was discharged from the hospital well. J. B. Blake recently operated about twenty-four hours after injury on a case of perforation of the intestine in which neither nausea nor vomiting had at any time appeared as symptoms.

Shock. — This appeared as an initial symptom in eleven cases of intestinal injury and in seven of contusion of the abdominal wall. It was recorded as absent in six cases of the more severe injury and in three of the less severe, and was not mentioned in three cases of the former and ten of the latter. As to its degree, it was severe in three cases of visceral injury and in two of simple contusion; it was said to have been moderate in four cases of the former and in two of the latter, and was designated as slight in one case of intestinal injury. So that neither from its presence nor from its degree can we draw certain conclusions as to the seriousness of the injury. This is to be expected, for shock is variable and its degree is dependent on many factors and many things influence its expression.

Faintness at the time of the accident was spoken of in three cases of intestinal injury and in one of simple contusion. In one case of each class there was complete unconsciousness immediately following the accident. These facts are mentioned as possible expressions of the amount of shock.

Muscular spasm. — This symptom was present at entrance in eleven cases of intestinal injury and in ten of simple contusion; it was absent in two cases of the more severe and in four of the less severe injury and was not mentioned in eight of the former and five of the latter class. The spasm may be general or local. It was general in five cases of each class and local in two cases of intestinal injury and four of simple contusion. Absolute ridigity of the abdominal wall was present at entrance in two cases of simple contusion and appeared in two others within twenty-four hours. Even the retracted belly, usually considered pathognomonic of a severe general peritonitis, appeared on the second day in a case of contusion, continued for about twenty hours and then disappeared. Thus the presence or absence of muscular spasm was not particularly associated with either lesion. It is sometimes hard to distinguish between voluntary and involuntary spasm, and this should always come into consideration in the examination of a patient.

Distention. — Distention was present at entrance in two cases of the more severe injury and in five of the less severe;

it was absent in twelve of the former and in seven of the latter class and not mentioned in six of the former and in eight of the latter. It is not a common early symptom, but is apt to develop with the onset of peritonitis. Its presence or absence as an initial symptom is of no practical importance.

Tenderness. — Next to pain this is the most constant sign in both classes, but is apparently of no particular value in the making of a diagnosis. It was present in eighteen cases of each class, was noted as absent in none of the cases of the more severe injury and in but two of the less severe, and was unmentioned in two cases of the latter. It was said to have been local in six of the cases of intestinal injury and seven of the cases of simple contusion and general in eight of each class.

External Signs of Violence. — As has been said, it is often very difficult to estimate from the patient's story the real force of the acting agent, and in this we are not markedly aided by the visible signs of the injury; even these are not always present. They were found in nine cases of the more severe injury and in six of the less severe, were absent in six of the former and ten of the latter and unmentioned in five of the former and four of the latter. The external signs usually appear in the form of an abraded or ecchymosed area; but the violence may occasionally be so severe as to rupture the abdominal wall and cause a hernia of the intestine. Yet even so marked a sign as that does not necessarily indicate the existence of intestinal injury. In two cases under consideration here hernia through the abdominal wall followed the impact of the blow. In one there was a coexistent rupture of the intestine. The other case occurred in a man of forty, who, while riding on the step of an electric car, was struck in the abdomen by the shaft of a wagon coming in the opposite direction. He was brought to the hospital unconscious and in marked shock. Just above the umbilicus and two inches outside the outer border of the right rectus was an excoriated area about as large as a silver dollar, covering a soft tumor, which was not tender. This proved to be a hernia. Operation was refused; all unfavorable symptoms disappeared in twenty-four hours, and the patient

was discharged with a hernia which, when unreduced, was about the size of an orange. The bowel had apparently suffered no marked injury, even though the external violence had been great.

As to the locality of the external sign, it was found on the right side in two cases of intestinal injury and in three cases of contusion, in the middle line in one case of each class and on the left side in six cases of intestinal injury; above the umbilicus in two cases of the more severe and in one of the less severe cases; below the umbilicus in seven cases of the former and in three of the latter. From these figures it appears that a blow on the left side and below the umbilicus is apt to cause the more serious injury. Makins (Annals of Surg., Vol. xxx, p. 137) considers a blow on the lower half of the abdomen of much more serious import than one on the upper half, and claims that, while blows on the upper abdomen can and do cause intestinal rupture, injury to the mesentery or omentum is equally probable.

Dulness. — In discussing this symptom, Makins distinguishes two kinds, viz.: (1) extensive areas of deficiency of resonance fixed in position, most commonly in one or the other flank: and (2) definite local areas of small extent. His remarks concerning these are worthy of repetition. "Of the two varieties the less extensive is regarded as of the greater importance. It is to be explained by the local infection produced by the rupture and is due to the effusion and development of plastic lymph producing early adhesions; this is a very early occurrence and at first is localized to the seat of injury. The larger areas of dulness are due to the contraction and collapse of large segments of small bowel almost invariably accompanying these injuries; this contraction may follow abdominal injuries where the gut is not injured. The importance of the sign depends rather on its fixity, which, as indicating its independence of free fluid in the belly, is an important exclusive sign, since ruptures of the intestine — excluding those accompanied by a rent of the mesentery — are rarely cases of free hemorrhage, and are not followed by free escape of intestinal fluid into the peritoneal cavity."

In our series dulness was present in six cases of intestinal injury and in three cases of contusion. Its absence was remarked in four cases of the former and in ten of the latter class; and in ten of each series its presence or absence was not mentioned. Excluding instances where it was found in the flanks, it was present as a definite, localized area in four of the more severe and in two of the less severe cases. It seems somewhat questionable that in the first few hours following the injury there should be sufficient plastic exudation about the injured spot in the intestine to give detectable dulness. We would, perhaps, be more apt to find an area of intense congestion about the point of injury. In a case of ruptured intestine operated on by Watson within a very few hours of the injury, he found the intestine *in all directions* covered with fibrinous flakes. Though these local areas of dulness were found more frequently in the cases of injury to the intestine yet they were noted in the cases of simple contusion, and in neither class of cases were they sufficiently common to be of marked aid in deciding the diagnosis. However, it is a point worthy of careful observation in all such cases.

The Temperature and Pulse. — The temperature was subnormal in six cases of intestinal injury, in three of simple contusion; it was normal in three cases of each series; it stood between 99° and 100° in one case of the more severe injury, in four of the less; in one case of each class it was between 100° and 101°; in two of intestinal injury and one of contusion, between 101° and 102° and it was not mentioned in seven of the latter class. Other than the fact that the temperature was subnormal in more cases of intestinal injury than of contusion, consideration of this symptom affords us no information.

The pulse was 70 or less in two cases of injury to the intestine and in three cases of contusion of the abdominal wall; it was below 90 in seven cases, below 100 in ten cases and over 100 in three cases of each class. Its quality was described as good in seven cases of the more severe injury and in five of the less severe, and as poor in three of the former and in six of the latter class. A case illustrative of how deceptive the pulse may be was recently admitted to

the City Hospital. The patient had suffered an abdominal contusion from having been caught between two electric cars. He was brought to the hospital immediately. He vomited and was rather restless but was not pale; his pulse was 110 and of good strength. He was operated on 12 hours after receiving the injury; at the time of operation his pulse was still 110. His belly was found full of blood, and active bleeding was still going on from a torn mesentine artery.

So we obtain nothing definite from a study of these symptoms. As shock lessens, here as elsewhere the temperature is apt to rise and the pulse to fall. Unfortunately in most of these cases a careful hourly record of the pulse and temperature was not kept; it is probable that if we hope to get any information of value from a study of these signs it is only from such a record that we can get it. A single observation of either or both signs is of absolutely no importance. Repeated observation of the *course* of the pulse and temperature, especially of the former, would probably prove of value. The temperature is of as little importance in these as in other abdominal cases. Observation of the pulse is unquestionably of importance.

Consideration of the combinations of symptoms leaves us in just as much doubt regarding the diagnosis as that of the individual symptoms. In the twenty cases of intestinal perforation there were eleven different combinations of symptoms. Pain, tenderness, muscular spasm and vomiting were found associated four times; pain, tenderness and external signs of injury, three times. These are the combinations found associated in the greatest number of cases; they are certainly not incompatible with a very simple injury, and are of no importance from a diagnostic standpoint.

Results and Conclusions. — Of the twenty cases of injury to the intestine nineteen died and one recovered. Eleven of the cases underwent operation; nine were treated expectantly; of the latter all died; of the former, one recovered. Of the operated cases, one was submitted to operation less than four hours after entrance to the hospital and recovery followed; four were operated on five or six hours after; one

twelve hours, four, twenty-four hours and one, forty-eight hours after; all these died.

In the fatal unoperated cases the average duration of life after the receipt of the injury was 2.33 days, the extremes being 7 days and 1 day; in the fatal operated cases the patients lived on an average 2.85 days after the receipt of the injury, the extremes being 9 days and one-half day. Thus operation tends to lengthen rather than shorten the patient's existence.

In the cases of simple contusion of the abdominal wall the symptoms disappeared in an average of 4.4 days, and such cases were discharged in from 8 to 15 days. In two cases of this series exploratory incisions were made; nothing abnormal was found in either, and uneventful recovery ensued in each case.

A further study or discussion of the symptoms of these two classes of cases can bring us no other conclusion than that the physical signs correspond neither to the amount of violence exercised nor to the amount of injury done. No one sign or combination of signs is sufficiently constant to indicate the nature of the injury or to serve as a basis for diagnosis. Our only present means of making an exact diagnosis sufficiently early for treatment to be of avail is an exploratory laparotomy. When we wait for the usual signs of intra-peritoneal trouble to present themselves we wait too long. Even improvement in the symptoms in the first few hours should not be allowed to deceive us. The reaction from the shock may cause such a temporary improvement even in the most dangerous cases; but instead of causing us to hesitate in our procedure it should on the contrary be seized as a favorable opportunity to go ahead. True many, and perhaps, very many, laparotomies may be done and no visceral injury found; but the danger to life in such an event is exceedingly small, and the necessitated additional time to be spent in bed is not to be weighed against the possible life that may be saved and will be saved in many a case. Early operation will not lead to the recovery of every case of intestinal injury; but it seems far more reasonable than operation after signs of beginning

general peritonitis have appeared and almost all chances of recovery have disappeared.

As far as statistics go they tend only to strengthen our position. Nimier (Arch. Méd. et Pharm. Mil., Mar., 1898) mentions 307 cases of abdominal contusion caused by horse kicks. All were treated expectantly, 215 recovered, and 92 died. The 215 cases that recovered offer no particular lesson to us. Our interest lies in the 92 that died. How many of them would have been saved by an early exploratory incision and the knowledge thus obtained?

Schimitt (Münch. med. Woch., July 19, 1898) finds that a mortality of 97.5 per cent. has followed the expectant treatment of cases of abdominal contusion with symptoms sufficiently severe to suggest possible perforation of the intestine. On the other hand, Petry (Quoted in Prog. Med., June, 1901) presents a table of 42 similar cases, operated on between 1883 and 1896, which show a mortality of 66.7 per cent., while Kirstein's (*Ibid.*) 18 cases, operated on between 1897 and 1899, resulted in a mortality of 55.5 per cent.; in four of his cases laparotomy was done within five hours after the receipt of the injury; all these recovered, and his statistics bear out the fact that every hour that goes by after the receipt of the injury lessens the prospect of cure by operation. The reported mortality of cases operated on in the first 24 hours is 45 per cent.; after the first 24 hours 66.6 per cent. These figures, compared with the 97.5 per cent. mortality of the expectant plan, speak for themselves, and make a strong plea for very early interference.

To sum up in a few words, it may be said that, at present, we have no certain means of distinguishing between a simple abdominal contusion and one complicated by severe intestinal injury except through an exploratory incision. This to be of most avail must be done within a very short time (3 to 5 hours) after the receipt of the injury. Having no other certain method of diagnosis and the promptness of the operation being the feature necessary for its success, exploratory laparotomy, combining as it does opportunity for a certain diagnosis and the best possible treatment, if severe injury be present, should be a very early routine measure in all but the most trivial cases of contusion of the abdomen.

VIII.

LYMPHATIC AND PORTAL INFECTIONS FOLLOWING APPENDICITIS.

JOHN C. MUNRO, M.D.

LYMPHATIC or portal infections, singly or combined, following appendicitis are not so rare as many would have us believe. The obscurity of the symptoms, often insidious, at times fulminating; the difficulty in determining a lesion of the appendix, even when suspected, tend to confuse a group of symptoms already variable. In a paper published in the Proc. Phila. County Med. Soc. for Dec., 1900, and in the Therapeutic Gazette for Jan., 1901, I reported fourteen cases of these infections, eleven being confirmed at operation or autopsy. To emphasize the clinical picture I wish to add four more personal cases: it may help to establish more fully the conclusions that I ventured to make.

These conclusions, in brief, were that the degree of lymphatic infection is not dependent on the extent of the appendiceal inflammation, a mild, chronic appendicitis at times giving rise to a severe lymphangitis. That the lymphatic disturbance may date its origin from an appendicitis occurring many months beforehand. That persistent fever without other evident cause should suggest one or both of these infections. That spasm, tenderness, and fulness (spasm of the quadratus lumborum) indicates a retroperitoneal infection possibly due to appendicitis. That chills and hepatic tenderness, associated at times with jaundice may be of appendiceal origin, and *that this origin, especially in obscure cases, should be sought for most carefully in physical examination, in the personal history and if necessary in abdominal exploration.* That prompt and thorough drainage of the liver together

with the removal of the inflamed appendix offer the best means for recovery. That abdominal section, with definite free exploration of all abscesses within reach is far more satisfactory, not more difficult, and less dangerous than aspiration.

In reviewing the hepatic cases, one is impressed with their gravity, both from the difficulty of opening all or most of the abscesses, and from the hopeless struggle against the general emaciation and sepsis if the case is allowed to go on to extremes. That all abscesses of the liver are not scattered is shown by the result of twenty autopsies reported in the Presbyterian Hospital Reports for 1900, page 157, where single abscesses were found in thirteen cases in addition to three cases of recovery after operation where there were presumably single abscesses; that is, well over half did not have multiple abscesses, probably a better showing than if all the cases had been primarily infected from appendicitis.

Moreover, cases are known to recover by bursting outwards spontaneously into the lung or elsewhere, and even if there may be more or less scattered foci, it is not improbable that many of them will be taken care of by nature, provided the large abscesses are drained.

The superficial abscesses are easily recognized as small or large yellow swellings; when deeper they give the feeling of gummata, but when too small or too deep to be detected in this way the surrounding liver area is boggy and somewhat indurated; but this type is difficult or impossible to drain. For exploration I much prefer a groove director; it causes less bleeding, and the opening can be easily dilated to admit the finger which will break down the wall of contiguous cavities. Gauze packing usually controls all dangerous bleeding.

It is true that other and commoner lesions may be mistaken for these infections. Cholecystitis, cirrhosis and pyelitis have been explored not so much from positive belief that the lesion was lymphatic or portal but because if there was a reasonable possibitity that such might be the case it was better surgery to explore too early rather than too late.

Practically all lymphatic infections are curable by operation. Only a rare case of hepatic infection will be cured, but

if the cases are allowed to go on until they become septic skeletons before operation, the chances are almost hopeless.

In brief, a persistent temperature, during or following appendicitis inconsistent with other lesions and associated with lumbar spasm should suggest a lymphangitis. More or less, perhaps fleeting jaundice, irregular chills, hepatic tenderness and progressive emaciation should suggest a portal pyophlebitis following appendicitis, present or remote. In illustration I will very briefly report four cases.

Case 1. — E. C., male, aged eleven. Previous attacks probably appendiceal. In third day of present attack, appendix with gangrenous mucous tube and portion of mesentery removed. Drainage. Two days later, the local condition being satisfactory, chill followed in six days by marked hepatic tenderness and jaundice. The chills and jaundice continued more or less irregularly while the general condition steadily and rapidly grew worse. Thus losing ground until he resembled a victim of the India famine, operation was allowed three and a half weeks after the appendectomy. Incision through the right rectus exposed a swollen left lobe in which several abscesses lying about half an inch from the under surface were opened, broken down freely and drained. A second incision from the tip of the last rib exposed the misplaced right lobe in which a large cavity, about two inches in diameter, was opened and drained, the neighboring tissues being broken up quite freely. The operation was well borne. Afterward the condition improved somewhat, the temperature falling to normal, and the pulse to 100–110. For a fortnight it seemed as though he would recover, when he suddenly collapsed and died. Unfortunately no autopsy was allowed.

Case 2. — H. C. B., male, aged thirty-five, entered the medical side with acute appendicitis and jaundice. Three previous attacks probably appendiceal. An up and down, irregular temperature for a month, with occasional chills, varying jaundice and increasing leucocytosis and a steady, progressive emaciation. When transferred for operation there was emaciation, sepsis, cyanosis, slight jaundice, doubtful appendiceal tenderness, enlarged left lobe and spleen. Operation.

Median incision. Uniformly swollen left lobe with deep abscess, easily felt, which was opened and drained. Right lobe explored, but no abscess found. In poor condition at beginning and close of operation. Slight improvement followed for a few days; death eight days after operation. Autopsy showed a left subphrenic abscess; enlargement of all mesenteric glands; mesenteric and portal pyophlebitis; portal veins through left lobe dilated and containing pus; in right lobe, particularly towards right superior surface, numerous small abscesses arranged in clusters 3 to 5 cm. in diameter. Smears from portal vein and subphrenic abscess showed streptococci.

The subphrenic abscess was overlooked at operation, the low level of the spleen and left lobe being apparently due to general enlargement. Could the patient have stood anything but a hasty operation it would probably have been detected.

Case 3. — T. A. T., male, aged seventeen. Operation by Dr. Nichols in second attack of appendicitis on the fourth day; suspicious jaundice of sclera at this time. The wound behaved well, but varying jaundice persisted with chills, delirium, increased liver area and tenderness and marked emaciation. At close of two weeks the liver was explored. Right lobe swollen and oedematous, but no pus found. A large, softened, retroperitoneal gland opened and drained of foul pus; several smaller but not softened glands felt. Eight days later again explored and a necrosis of the ascending colon found together with a small broken down gland in the iliac fossa, at some distance from the group found at the preceding operation, this group having practically disappeared. Death two days later. Autopsy showed thrombosis of the superior mesenteric veins and branches; suppurating pylephlebitis with multiple abscesses of the liver, 1 to 2-3 cm. in diameter; two ulcers of the colon (one perforated at operation), chronic tuberculosis of the retrocæcal lymph glands.

One cannot exclude the rôle that the two ulcers may have played in the formation of the liver abscesses, but in all probability the appendix furnished the infectious material. The abscesses were too small and scattered to be drained, and

the hopelessness of the case was much increased by the necrosis of the gut and the lymphatic infections. All this might have been avoided by an appendectomy following the first attack.

Finally to show that a fatal lymphatic infection may follow an interval operation the following case is reported:

Case 4. — Mrs. E. A., aged thirty-three, severe attack of appendicitis two months before operation; in bed four weeks and then an invalid for four weeks when a twisted, adherent appendix was removed, the base being ligated with catgut and the stump covered with a peritoneal cuff sutured with fine silk. Progress good for about a week. On the twelfth day, under chloroform, incision to outer side of the aseptic wound, opening from behind the peritoneum a small limited abscess in the region of the stump. The discharge persisted from the last wound without improvement in the general condition, and four weeks later Dr. H. W. Cushing opened a foul subphrenic abscess. In spite of this the patient steadily lost ground, and died seven weeks after the first operation. Autopsy showed no adhesions to first scar; second incision entering cavity at region of appendix whose origin was healed. Pelvis walled off by firm adhesions and filled with dirty pus. No direct connection with the appendix was noted, but may have been present. Pelvic organs normal. Under surface of right lobe of liver and especially of gall bladder firmly adherent to duodenum. Abscess in right pleura; incision into this cavity, passing through diaphragm to region of under surface of liver where there was a small amount of dirty pus. Mesenteric glands prominent and reddish.

It is unfortunate that the stump was treated by the cuff method rather than by the safer inversion method. It is barely possible, though it does not relieve the responsibility, that the lymphatics infected at the original attack of appendicitis needed only the operation-infection to start the final explosion. The pelvic accumulation was of course due to one or the other of the operations, but was never detected as serious enough to call for interference.

IX.

USE OF THE GALVANO CAUTERY IN TUBERCULOSIS OF THE LARYNX.

BY THOMAS AMORY DE BLOIS, M.D.

IN the Throat Department we see many cases of that most distressing condition, tubercular perichondritis of the larynx.

It is painful to note the rapidity with which these poor patients slip away; first, emaciating, from the irritating and tickling cough and the fatigue incident to their terrible efforts to speak aloud (for they are all possessed with the idea that they must talk, simply because they know they can't), secondly, — the stage of painful deglutition, where the food must be selected, always made soft, and swallowed with the greatest care, and in consequence very little is taken, and lastly, great dysphagia, scarcely any swallowing possible, and that, only, in the form of liquid nourishment, supplemented sometimes by rectal feeding, and such delusions.

It is scarcely to be wondered at that we are ready to try almost any procedures, no matter how unpromising, with the hope of retarding, if not, of arresting the inevitable and fatal result of this terrible lesion of tubercular infection.

In an exhaustive paper by Dr. J. W. Gleitzmann "Transactions of the American Laryngological Association," Rochester, N. Y., 1895 (also "Report of the Progress made in the Treatment of Laryngeal Tuberculosis since the last International Medical Congress," — J. W. Gleitzmann, Moscow, Aug. 20, 1897), various surgical and medical procedures for the arrest and cure of this condition are discussed; Dr. Jonathan Wright of Brooklyn, a pathologist of most undoubted authority, makes the statement that laryngeal tuber-

culosis occurs in about twenty-five per cent. of all tubercular cases, and the opinion appears to be general, that if tubercular ulceration of the pharynx and larynx depended entirely upon the direct implantation of the bacillus of tubercle — the situation of the parts are such, that all cases of tuberculosis would be infected primarily in the upper air passages — and laryngeal tuberculosis would be as general as faucial membrane in diphtheria. "There appeared to be some antidotal properties in the secretions of the pharynx and larynx" — Dr. E. L. Shurly of Detroit had attempted direct infection of monkeys by scarifying the larynx and applying tubercular cultures.

Although in cases of tubercular laryngitis physical signs are generally present, yet there are many cases in which no corroborative evidence of general infection can be found; examination of the sputa is negative and even scrapings from, and sections of, the laryngeal tissues do not show the bacillus of tuberculosis.

In one or two cases of buccal lupus, I have had negative reports from scrapings, which I submitted to the Pathological Department of the Boston City Hospital.

In a third paper on this subject by Professor Gleitzmann, dated April, 1901 ("Primary Pharyngeal and Laryngeal Tuberculosis, two cases cured"), he seems to have somewhat changed his mind as to the pathology. He says, "But a still more cogent reason for the author to present them (the two cases above referred to) here, was that, in his opinion, they serve as a further additional proof of the still much mooted question of the existence of a primary tuberculosis of the pharynx and larynx without pulmonary complication." "It was necessary to prove first the existence of Laryngeal Tuberculosis in the living, and second, by the absence of pulmonary tuberculosis on post-mortem. And such cases have been reported by Demme, E. Frankel, Progrebinski and Orth." Many living cases have been so reported, including the two of Dr. Gleitzmann. But what may not post-mortem show in these? Because the local lesion is healed, does that show that there is not a tuberculous process going on in the lungs or that it will not start. The fact that tuberculosis

has been proved to exist in the joints and other parts of the body without there being physical signs in the lungs would seem to lend weight to the theory that laryngeal tuberculosis may be a primary implantation.

So it would seem as if the pathology was most contradictory and confusing!

The opinions of the treatment of laryngeal tuberculosis are quite as various. Most scoff at surgical procedures, and rely entirely on general systemic treatment and even topical applications, if in the form of escharotics; caustics or astringents are regarded as worse than useless, and "meddlesome surgery" is hinted at by many who regard this as entirely a medical lesion.

Of all the local medical applications to laryngeal tubercle there is none that enjoys the universal good opinion that lactic acid does. It was introduced by Krause in 1885, and has held position ever since. Five to twenty per cent. solutions in glycerine of parachlorphenol are recommended by Simonousky Spengle of St. Petersburg, Zinn, Hedderich and others; and W. Freudenthal, May, 1901, "Treatment of Laryngeal Tuberculosis at the Montefiore Home for Chronic Invalids, New York," is very enthusiastic over the orthoform — menthol emulsion treatment.

Surgically, laryngeal tuberculosis has been treated (besides extirpation of the larynx or part of it) by first, incision with knives and scissors, second, scraping with the curette, third with sub-mucous injections, fourth, with electrolysis and fifth, the galvano cautery.

It is my experience with this fifth or last procedure that I wish to report, for although the curette may seem rational, because it removes at once a large amount of more or less diseased tissue, yet the possibilities of setting up an alarming, or to say the least, a greatly weakening, hemorrhage in a usually, anæmic patient is a possibility to be avoided. Besides the hemorrhage there is again the probability of deep ulceration, which may not have before existed, and which would probably follow the removal of the tubercular vegetation.

Although the interarytenoid vegetation is frequently the

form taken by laryngeal tubercle, yet it is not always so. And curetting would hardly be justifiable on the free borders of the vocal bands, if that were the point of tubercular prolification.

On the other hand, the cautery point removes so little tissue, and seals up the seat of operation after the work is done, so that its choice would appear to be for the best except where the growth was abnormally large.

The operation on the larynx with the cautery point requires not only delicacy of touch, but a good deal of quickness, for the larynx is never kept open after the first touch of the platinum, and unless one is very quick with the contact button he is surprised afterwards to look into the larynx and find that he has not in the least burned what he intended to, but on the other hand, has touched up some quite innocent parts.

The length of the laryngeal electrode, from the top of its curve to the end of the platinum point should be at least four inches (the ordinary laryngeal forceps measure from 3 to 3½ inches) and should be nearly at right angles to the handle. Of course, with a longer one it would be easier to reach the larynx, but on the other hand would be more difficult to turn in the mouth, for when the mouth is forcibly opened the distance between the cutting edges of the upper and lower incisor teeth only averages about 2½ inches.

The patient's larynx must be thoroughly cocainized with two or three sprayings of five per cent. solution of cocaine. The patient must hold his own tongue, and the full power turned on the electrode so that the heat may come as quickly as possible. The mirror, being well warmed, and held in the left hand, the electrode is passed quickly into the larynx during forced inspiration, and it should be carried as far as possible into the growth itself, so that when the inevitable spasmotic closure of the glottis does take place, the cauterization will be of the growth, or ulceration, and not of the surrounding mucous tissue.

After searing, it is well to spray the parts with some alkaline lotion, or else insufflate some bland powder.

Slight reduction in size usually follows this procedure, and it should be repeated in from five days to a week. Sixty per cent. solution of lactic acid should be applied occasionally, and I have usually relied much on Von Heyden's creosotal internally.

My first case was in 1898. Jenny R., a woman of 35, sent by Dr. Vincent Y. Bowditch to me in the Throat Department, Boston City Hospital. The bacilli of tubercle had been found, also physical signs, and there was in addition the inter-arytenoid prolification, found in laryngeal tuberculosis, the pyriform swelling of the arytenoids was absent. Lactic acid, menthol, etc., were applied during the first half year, also the French capsules of morrhuol and creosote.

The growth increased, but did not break down, and the following year the galvano cautery was first used; perhaps as frequently as once a week, and by its constant use by the spring it had entirely disappeared, leaving in its place a slightly raised cicatrix. This patient has been under careful observation ever since, and there does not appear to be any evidence that the lesion will return. The lung is so much better that I think it might be regarded as an arrested case.

Second case: Rose M., age 21 years (single), a sister of the above, appeared at the City Hospital August, 1900, where a diagnosis of follicular tonsillitis was made. I first saw this patient at my office in September, 1900. She was very hoarse, and had an almost constant and racking cough. Examination of larynx showed slight arytenoid swelling, and a well marked inter-arytenoid vegetation. The sister (Case I.) came with her, and was very anxious that I should use the galvano cautery as I had on her. I did so, but found great difficulty in doing it, not so much from the incessant cough, as from the great depth at which the larynx seemed to be situated. The first burning seemed to be followed by good results, and the patient was put on tonics and creosotal.

In October she returned to the City Hospital clinic and the use of the cautery was resumed. And it certainly appeared to diminish the vegetation which was situated directly between the arytenoid cartilage, and was apparently about

the size of a split pea. Von Heyden's creosotal was used as much as the patient's means would permit, and she got along very well until I left the hospital during the month of January last. When I returned in February the growth had increased considerably, and there was a great deal of dysphagia. She was quite weak, and her cough was very distressing, and there were complications in the lungs.

From last March there was nothing but the regular march of fatal symptoms, weakness, almost starvation, cessation of the menses, emaciation. She has since died.

Third case: J. J. S., age 39, married, stained glass worker. Was first seen at the hospital October 15, 1900. There was simply a slight inter-arytenoid swelling, and he had come from the Medical Out Patient's Department with a report of "no t. b." in sputa. On November 15, my assistant, Dr. Fisher, found tubercle bacilli, and he was put on creosotal and heroin for his distressing cough, and the galvano cautery was used about once a week on the inter-arytenoid growth which had commenced at the before-mentioned swelling. This latter procedure appeared to arrest the disease, and as long as he came to the hospital his improvement was marked. But he was lost sight of, and so I am unable to say as to his subsequent history. (Oct., 1901.— He has reappeared, and the growth has advanced very little.)

Fourth case: John H., age 30, single, decorator by trade. He was seen by me three or four years ago, and cauterized at the Boston City Hospital for laryngeal tubercular growth, (inter-arytenoid.) I saw him again on the 15th of last October at the hospital. The growth had only then commenced for a second time to proliferate. It was cauterized at intervals during the winter and spring, and when I left at the end of March, 1901, he was certainly quite as well as he was six months before. The disease was apparently again arrested.

I might supplement these cases by two in private practice which I have had during the last year, both being males, and both having the laryngeal disease located in the arytenoids themselves, instead of the interspace. There was marked pyriform swelling in both cases. One patient died in about two months; the other is going down hill as fast as

possible, and now (October, 1901) cannot live more than a few weeks.

In the first four cases reported the lesion was in the inter-arytenoid space only. I once removed an entire vegetation with the forceps, but in a week or two it was replaced by an extensive ulceration, and the patient died in two months.

My deductions from these experiences are:

First: That good results, or, to say the least, a retarding of the disease by cauterization can only be expected when the tubercular vegetation does not involve the arytenoids.

Second: The case must be seen early if you hope to do anything.

X.

DERMOID CYSTS AND TERATOMATA OF THE ANTERIOR MEDIASTINUM.

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THE general subject of dermoid cysts and teratomata is one of much interest. This is due in part to their relative infrequency; in part to the problem of their genesis and the many theories which have been advanced for its solution. In regions of the body, as the ovary, they are comparatively common; in others they are quite unusual. In the anterior mediastinum they are so infrequent as to seem to justify the report of a new case, the attempt to draw some conclusions from the cases previously reported, and some discussion as to their origin in this particular region.

The patient whose case we have to report, is one of Drs. McAllister and Davis of Lawrence, Mass., from whom the following brief history was obtained:

Patient is a female, age 38 years. She is married and has had one child. For the past six years she has complained of what she termed trouble in the chest and gives a history of night sweats. For two years she has coughed up hairs at intervals. These have generally been few in number. For five weeks she has suffered from severe pain in the chest and has had cough with purulent expectoration. During this time there have been several attacks of haemoptysis, during some of which she has almost strangled. On physical examination there is dulness in the right chest, and this has been noted to decrease in extent after attacks of coughing during which much material was brought up.

Several hours before death, which occurred March 21, 1901, there was a gush of blood and pus from the mouth and with this material were mixed a few hairs. At autopsy (Boston City Hospital, U. 01.8) a tumor as large as a cocoanut is seen occupying the lower portion

of anterior mediastinum. On opening this a pint of fluid and solid material escapes. Lungs and heart removed en masse.

Left Lung. — Pleural and diaphragmatic surfaces smooth and glistening. Anterior part of lower border of upper lobe is adherent to adjacent pleuro-pericardium by fibrous bands, which are easily broken up. Lung appears normal.

Right Lung. — Surface is covered with shreds of old fibrous adhesions which everywhere bind lung to parietes. Between lower and middle lobes there are slight adhesions; between upper and middle lobes the division is obliterated. The middle lobe is small, and only the lower portion comes to the surface, the other parts being hidden beneath the upper lobe. The entire lung is pushed backward and to the right by the tumor mass. The right lung is slightly increased in density, and is distinctly less voluminous than the left, but there are no firm areas to be felt except in immediate connection with the tumor wall.

Bronchi are congested. Their mucous membrane is smooth and glistening, apparently not thickened. Little secretion.

Peribronchial lymph nodes deeply pigmented, not enlarged.

Pericardium. — Parietal layer in many places is covered with villous masses of fibrin. These are most abundant on surface adjacent to the tumor. In other places surface is roughened in ridges, but is at the same time glistening. There are everywhere scattered minute subpericardial haemorrhages. This condition is particularly marked on surface adjacent to the tumor. Visceral layer, except over lower portion of left ventricle, shows similar larger, longer, and more profuse villous masses of fibrin which are pulled off and torn apart with ease. Surface of lower portion of left ventricle is glistening, is slightly roughened by thickenings of pericardium, and shows numerous small subpericardial haemorrhages.

Tumor. — Between the pericardium and the inner surface of the right lung there is a large tumor mass. This extends from the diaphragm to a point 4.5 c.m. above the bifurcation of the trachea, and is attached to the whole inner surface of the right lung from its base to a point 6.5 c.m. below its apex. The upper limit of the tumor mass is approximately on a level with the top of the arch of the aorta. It is in apposition to the diaphragm over an area about 9 c.m. in diameter, but not adherent to it. Anteriorly it is bounded by the chest wall and a small part of the lower portion of the upper lobe of the right lung. Posteriorly it is in direct relation with the lower lobe and lower part of upper lobe of right lung. The right primary bronchus lies just behind and in close relation to the upper portion of tumor mass.

There is no pedicle to tumor and no process connecting it with organs of neck or structures forming anterior chest wall. A vertical incision, 14 c.m. long, in the front of the tumor has allowed the

escape of considerable fluid and solid material. There remains in the cavity about 200 cc. of white material, in places slightly tinged with yellow. This is greasy, soft, friable, and full of long, delicate, curly, blond hairs. These hairs are almost white and approximate one-half the diameter of the ordinary fine human hair. Some are 4 to 5 c.m. long. Many are tapering at one end.

The cavity distended measures about 14x12x10 c.m. ; its longest diameters are the vertical and antero-posterior. The anterior and lower wall of cavity is of firm dense white fibrous tissue, 2-3 mm. in thickness. Over the anterior part between wall of tumor and pleura there is in places a layer of fat and fibrous tissue, 5.6 mm. thick. In the lung tissue, adjacent to tumor wall, there is evidently a considerable fibrous tissue increase which causes an apparent thickening of the wall on that side.

The cyst is lined with a smooth, glistening, whitish membrane in which are a few fine congested blood vessels. In the right half of the tumor there are small, scattered, bony plates adherent to the wall. The entire inner surface of tumor is trabeculated, and running out from the main cavity are several small cul-de-sacs, varying from 0.5 to 1.5 c.m. in greatest diameter. Between one of these and a medium sized bronchus there is an opening 0.5 c.m. in diameter. This opening lies just at the beginning of the upper branch of the main bronchus. Other bronchi are in very close relation to the cavity, but do not open into it.

In parts of the tumor the trabeculae are very well developed. Many of them are distinct rounded cords, 1 to 3 mm. in diameter and 4 to 10 cm. in length, running from one side to other of cyst cavity. They are of firm fibrous tissue. Across the upper part of the cavity runs a trabecula 6 cm. long. Attached to this on one side is a mass shaped like the segment of an orange which is 4 cm. long, 2 cm. broad, and 2 cm. thick at its outer edge. On the other side is an irregular spoon-shaped tag, 4 cm. long, 3 cm. broad, and 0.5 cm. thick. Near this is another band of fibrous tissue 5 cm. long. Attached to it is a mass 5 cm. long, 4 cm. broad and 1.3 cm. thick. From these the hair seems to have had its origin, because there are long hairs attached here.

Microscopic Examination. — (Technique-Zenker's fluid-paraffin-eosin and alkaline methylene blue).

Sections through polypoid excresence show irregularly undulating surface covered with epidermis. Externally there is a distinct stratum corneum. Beneath this there are a few flattened cells some of which show eleidin granules. These pass by gradual transition into large polygonal prickle cells forming a layer five or six cells deep. Next to the corium is a somewhat illy defined layer of cuboidal cells forming an indistinct stratum Malpighii. Papilla formation is almost entirely absent, though there are at points slight epithelial

downgrowths into subepidermal tissue. In this tissue are numerous well developed sebaceous glands and a very few hair follicles out of which the hairs have fallen, but no sweat glands. The subepidermal tissue consists of loosely woven connective tissue with scattered foci made up of a moderate number of plasma cells, a few lymphoid cells, and an occasional polymorphonuclear leucocyte. In the central part is a small amount of adipose tissue. Fair number of blood vessels present.

Sections through cyst wall show on surface a similar layer of epidermis with slight stratum corneum and no papilla formation. No hairs, sebaceous glands, or sweat glands present. Epidermis lies immediately on a dense, cell-poor, very slightly vascular layer of lamellated, somewhat hyaline connective tissue. Beneath this is a layer of adipose and connective tissue which is more vascular and contains numerous lymphoid and plasma cells.

In 520 cases of mediastinal disease, exclusive of diseases of the heart and aorta, collected by Hare[1] in 1889, there are 288 cases of true tumor. Of these, 10 are dermoid cysts. (Hare tabulates 11 cases of dermoid cyst but his 9th, attributed to Naumann,[2] is the same case as his 1st, reported by Lebert.[3] His 11th case, attributed to Finkler,[4] is more usually given as Pinders[5] case I.) Hoffmann,[6] 1896, collected 12 cases of dermoid cyst of the anterior mediastinum. Planz[7] reported 25, but of these the case of Spath[8] does not seem justly included, since it appears to be a malignant tumor or possibly a tubercular process originating from the vertebræ. At any rate there is no evidence of the presence of cysts of a dermoid character and the author himself did not regard it as being of this nature. Finally Ekehorn[9] in 1898, gathered twenty-nine and added two cases of his own. To these we have been able to add several from the literature and with our own have tabulated 40 cases. Though this list is possibly not complete it comprises the vast majority of reported cases since the first of Gordon,[10] whose case was presented Nov. 25, 1823, though his paper was not published until 1827.

Number.	Reported by	Sex.	Age.	Symptoms.	Duration.	Physical Signs.	Tumor.		
							Position.	Size.	Structure.
1.	Gordon.[10]	F.	21	Symptoms of pressure on respiratory tract.	1½ yrs.	Pulsating tumor in neck.	Behind upper ⅔ of sternum.		Cyst with fatty débris, hairs, bone and teeth.
2.	Mohr.[11] also Münz.[12]	F.	28	Cough. Hair in sputum.	14	Diminished expansion left chest. Dulness. Respiratory sounds absent.	Left lung.	Large.	Cyst lined by epidermis, with hair follicles, sebaceous and sweat glands. Cartilage and bone. Greasy contents with hairs.
3.	Büchner.[13]	F.	36	Pain. Expectoration. Hæmoptysis. Rapid respiration.	⅔	Dome-shaped projection of R. chest, 2d–4th rib. Dulness.	Right chest, 2d rib to diaphragm.	Child's head.	Cyst with fatty débris, hairs, cholesterin. Cartilage and bone.
4.	Lebert.[3]	M.	60	Dyspnœa, cough, bloody sputum.	Many years.		Behind upper ⅔ of sternum.		Multilocular cysts lined by cylindrical or squamous epithelium. Excrescences. Cartilage.
5.	Cordes.[14]	M.	28	No definite symptoms.		Heart dulness much increased and sounds weak.	Ditto.	Man's fist.	Cyst partly lined by epidermis, with hair follicles and sebaceous glands. Hair. Cartilage.
6.	Cloetta.[15]	F.	20	Symptoms of chr. pulm. tuberculosis. Hair in sputum.			Lower left lobe of lung and mediastinum.	Apple.	Cyst with hair and greasy material. Excrescences. Cartilage and bone.
7.	Salomonsen.[16]	F.	24	Cough, pain, expectoration, hæmoptysis.	10	Dulness, with weakened breath sounds.	Close to hilum of right lung.	Pigeon's egg.	Cyst lined by epidermis, with hair follicles and sebaceous glands. Bone.
8.	Collenberg.[17] also Waldeyer.[18]	M.	44	No history obtained.		Cyanosis.	Right thorax, 6th rib to diaphragm. Pedicle joining thyroid.	Larger than child's head.	Calcified cyst lined by epidermis, with sebaceous glands. Contents: hair and greasy material.

9.	Nobiling.[19]			Hair in sputum.			Lungs.		Dermoid cyst.
10.	Villard.[20]	F.	25				Bt. right lung and heart.	Walnut.	Cyst with some cornified epithelium. Contents greasy material and no hair.
11.	Pöhn.[21]	M.	34		24	Fluctuating tumor in neck.	Neck and upper thorax.		Cyst containing fatty material and hair.
12.	Virchow.[22]	M.	22	Pain, shortness of breath.		Dulness. Breath sounds absent. Painful nodule in chest wall with œdematous swelling.	Right thorax.	20 x 21 x 13 cm.	Partly multilocular cyst lined by epidermis. Contents, brei and hair. Partly solid of striated muscle, cartilage, glands, carcinomatous and sarcomatous nodules.
13.	Kückmann.[23]	M.	33	Shortness of breath. Hairs in sputum.	2	Fluctuant tumor in neck.	Neck and upper thorax.		Cyst with puriform material and hairs.
14.	Gäsaer.[24]								Cyst with hair.
15.	Marchand.[26]	F.	27				Right thorax, 2nd to 5th rib. Process to thyroid.	Child's head.	Cyst lined by epidermis with hair follicles and glands. Contents, fatty brei and hair. Thymus corpuscles.
16.	Paget.[27]						Behind manubrium sterni.		Cyst with hairs and sebaceous glands.
17.	Pinders i[5], also Finkler and Ribbert.[4]						Ant. mediastinum 1st to 5th rib.	Greatest dia. 17 cm.	Cyst with fatty caseous contents. Lympho-sarcoma.
18.	Pinders ii.[5]	M.	53				Near pericardium and left main bronchus.	Goose egg.	Cyst with grayish yellow brei.
19.	Loewenmyer.[28]	M.		Haemoptysis. Shortness of breath.	4	Dulness. Bulging of left chest, 1st to 6th rib.	Left thorax.	Child's head.	Cyst lined by epidermis, with fatty material and hair. Minor cysts lined by ciliated epithelium. Cartilage.

NUMBER.	Reported by	Sex.	Age.	Symptoms.	Duration.	Physical Signs.	TUMOR.		
							Position	Size.	Structure.
20.	Saugalli.[29]	F.	50	Long suffering.			Right thorax, middle lobe to diaphragm.	26 x 16 cm.	Multilocular cyst, lined by epidermis. Atheromatous contents, with hairs. Cartilage and bone.
21.	Godlee.[30]	F.	29	Pain. Shortness of breath. Hair coughed up.	8	Dulness, 3d rib to liver. Breath sounds absent.	Right thorax.	Large.	Cyst, with skin like wall. Excrescences.
22.	Sormani.[31]	F.	26	Cough. Hair in sputum. Dyspnoea. Pain.	16		Left lung.	Child's head.	Cyst with skin-like wall. Contents, atheromatous brei and hair.
23.	Marfan.[32]	M.	30				Ant. mediastinum, base of neck to pericardium.	Fist.	Cyst, no epithelium. Contents, fatty material and hairs.
24.	Koerte.[33]	M.		Pressure symptoms.		Fistula in ant. chest wall.	Behind upper sternum.	Fist.	Cyst, lined by epidermis. Hair. Excrescences.
25.	Harres.[34]						Between heart and left lung.		Dermoid cyst. Cartilage; bone.
26.	Jores.[35]						Left thorax.	Large.	Cysts, lined by epidermis, with hair follicles and sebaceous glands or with cylindrical epithelium. Teeth. Cartilage. Sarcoma.
27.	Bastianelli.[36]	F.	20		4	Fistula at base of neck	Neck and upper thorax.	Nut.	Cyst, containing fat and hair.
28.	Dardignac[37] also, Belin.[38]	M.	22	Difficulty in breathing.	4	Projection of right chest, 4th to 6th rib. Dulness.	Right thorax.	Large.	Cyst, containing hairs.
29.	Pflanz.[7]	M.	21	Difficulty in swallowing.	1	Projection of upper right thorax. Dulness. Breath sounds absent. Fluctuant tumor in neck.	Neck and thorax.	Large.	Cyst containing hair, flakes of epidermis and fatty débris.

30.	Smythe.[30]			Difficulty in respiration. Cough.	3		Left thorax, 1st–6th rib.	Large.	Cyst lined by epidermis with hairs. Bone.
31.	Jones.[40]	M.	9				Neck and thorax.		
32.	White.[41]						Bt. pericardium and right lung.	Tangerine orange.	Cyst containing hair, fluid and greasy material.
33.	Kretz.[42]	M.	30				Upper lobe of left lung, extending into ant. mediastinum.	Apple.	Cyst lined by epidermis, with empty hair follicles and sebaceous glands. Excrescences. Hair, pus and brei.
34.	Ogle.[43]	M.	28	Cough. Hæmoptysis.	5		Lower lobe of right lung, extending into ant. mediastinum.	6½ in. long.	Cyst lined with skin. Excrescences. Hair. Tooth.
35.	Ekehorn i.[9]	F.	21	Cough. Expectoration. Hæmoptysis.	34	Dulness. Weakened breath sounds.	Right thorax and lower ¾ of ant. mediastinum.		Cysts lined by epidermis. Hair. Teeth. Bone. Cartilage. Nerves and ganglia. Parts suggesting respiratory and digestive tracts and choroid.
36.	Ekehorn ii.[9]	M.	22	Spat up excretion containing hair.	1			Fist, 7 cm.	Cyst lined by epidermis, cylindrical and cuboidal epithelium. Hair, cartilage bone.
37.	Bergmann.[44]	M.	38			Swelling over sternum and adjacent 2d and 3d ribs. Fistula.	Superficial to sternum and communicating with intrathoracic cyst.	Goose egg.	Cyst lined by skin. Excrescences. Hair. Teeth.
38.	Mandlebaum.[45]	F.	30			Fluctuant tumor over right 3d rib.	Bt. right lung and pericardium.	8 x 6 cm.	Cyst lined by epidermis. Hair. Thyroid like vesicles.
39.	Cited by Hare.[46]			No data obtainable.					
40.	Christian.	F.	38	Trouble in chest. Expectoration of hair.	24	Dulness.	Bt. right lung and pericardium, arch of aorta to diaphragm.	14 x 12 x 10 cm.	Cyst lined by epidermis with hair follicles and sebaceous glands. Excrescences. Hair. Bone.

Sex. — If we analyze these cases we see that the sexes are fairly evenly represented. Of the cases where the sex is stated 17 were males, 14 females.

Age. — That a very large proportion of cases occur in young adult life is very strikingly shown.

10 to 20 years, 1 case; 20 to 30 years, 17 cases; 30 to 40 years, 7 cases; 40 to 50 years, 2 cases; over 50 years, 2 cases.

Dividing a little differently, under 20 years, 1 case; 20 to 35 years, 21 cases; 35 to 50 years, 5 cases; over 50 years, 2 cases.

These figures refer to the age at the time of death or operation. If we recall that several cases showed symptoms or physical signs a number of years before this time, then the preponderance of cases occurring in young adults becomes more marked.

Symptoms. — In 7 cases no clinical history is given. In 6 more it is evident that the previous symptoms had no connection with the existent tumor. In these cases death was due to other causes, and the tumor in the anterior mediastinum was of the nature of an accidental post-mortem finding. Where the tumor did produce symptoms these were most frequently referable to the respiratory tract. In 15 cases there was more or less dyspnœa or evidence of pressure on trachea or bronchus. In 16 cases there was cough, and in 12 of these free expectoration, often with foul odor. In 7 haemoptysis occurred. What is most interesting was the coughing up of hair which occurred in 8 cases, those of Mohr, Cloetta, Kückmann, Godlee, Sormani, Nobiling, Ekehorn's 2d case, and our own. This occurred at various stages of the disease, in Mohr's case 14 and in Sormani's 16 years before death.

In only one case is there a history of difficulty in swallowing. Pain in the chest is not a prominent symptom, and is noted in only five cases. Only twice was there local œdema or other evidence of involvement of the blood vessels, and in these two cases malignant growth was associated with the benign.

Physical Signs. — In 11 cases no note of physical examination is given. In 6 cases the chest on the side of the tumor

distinctly bulged. In 4 cases the tumor appeared in the neck through the superior aperture of the thorax. In four cases fistulæ between cyst and cutaneous surface formed. In 10 there was dulness on percussion over the area occupied by the tumor. Auscultation in these regions showed respiratory sounds suppressed in 4 cases and greatly weakened in 2 more. Three cases gave signs of chronic pulmonary tuberculosis.

Duration. — This in most cases is very difficult to estimate. In 23 cases the onset of some symptom was definitely enough stated to form the basis of an estimation, and the figures given are approximately correct.

Duration of less than one year, 2 cases; duration of 1 to 2 years, 6 cases; duration of 2 to 5 years, 6 cases; duration of 5 to 10 years, 3 cases; duration of 10 to 15 years, 4 cases; duration of more than 15 years, 2 cases.

Thus in the majority of cases reported the course of the disease has been a relatively slow one, a period rather of years than of months. In strong contrast to these, are the cases of malignant disease of the same region reported by Harris,[47] in which the average duration is given as six months.

Position of Tumor. — In 18 cases it was situated in the upper half of the thorax, and was wholly or in part immediately behind the upper portion of the sternum. In 8 cases it was situated in the lower half of the thorax, between the heart and adjacent lung. In 6 cases it occupied nearly the entire pleural cavity. In one case it had a position near the hilum of the lung. In 6 cases the tumor appeared in the neck in the suprasternal notch or above one sterno-clavicular articulation. In 4 cases the tumor was embedded in lung tissue.

The most frequent position then is the upper part of the anterior mediastinum. Here there is a potential space between the sternum in front and great vessels behind, capable of accommodating a medium sized tumor. Development of the tumor beyond a certain point in this region would be resisted in front by the bony wall of the thorax, behind by the great vessels and trachea supported by the vertebral column. Growth would be possible in three direc-

tions, upward through the superior aperture of the thorax, laterally into the pleural cavity and downward between heart and lungs. These three directions of expansion are illustrated in different cases.

For some cases a previous position in the upper anterior mediastinum can be assumed. Portions of some of the largest tumors still extend into this region, and it would seem probable that with them a change of position has taken place along lines of least resistance merely to accommodate adequately their bulk. In other cases there is proof of their development in this region and subsequent migration. In these we find pedicles extending from the tumor to the root of the neck (cases of Collenberg and Pinders). Lastly the presence of structures in the tumor whose origin is referable to organs in this region, as in the case of Mandlebaum supports this view. In several cases, especially those studied only at the time of operation, the description is too incomplete to be able to accurately localize the tumor or to form an opinion of its probable origin. In other tumors which were situated at a lower level and which were accurately studied there is no evidence of a different earlier position. Though for these there is some probability of the same origin from the upper anterior mediastinum, a primary development in the lower mediastinum can not be excluded, a point which will recur in the discussion of the genesis of this group of tumors.

In four cases the tumor was in the lung. However it does not seem probable that these originated in the lung, since the lung, entodermal in origin, could furnish no *anlage* for these ektodermal structures. They have rather grown into the lung, most probably from the mediastinum, a theory supported by the gradations found between complete envelopment by lung tissue and simple adhesion to the surface of the lungs.

Relations to other parts. — In almost every case there were adhesions to some adjacent organ, and often these were very extensive. The tumor was most frequently bound to some part of the lung and almost as often to the pericardium. Less frequently they were attached to other structures as

chest wall, diaphragm, or great vessels. These adhesions would form a serious difficulty in any attempt at complete removal of the tumor, and in most cases would prevent anything further than incision and drainage.

These tumors, though occupying a position surrounded by vital organs and generally in actual union with them, do not as a rule produce great destruction of adjacent structures. In one case the aorta was eroded; in a second there was a communication between tumor and pericardial cavity. Much more frequently have they eroded into the lung and formed a communication with a bronchus. This happened in 13 cases.

Size varies from a pigeon's egg to a tumor larger than a child's head. The larger tumors are more frequent as might be expected since the symptoms result from pressure, and these as a rule do not appear early in tumors which grow slowly and allow neighboring organs to accustom themselves gradually to changed conditions.

Structure. — A consideration of the structure of these tumors shows that they may be divided into three classes: first, those of slight complexity which are essentially dermoid cysts of ektodermal origin; second, those of great complexity which contain derivations from all three germ layers with the formation of rudimentary organs (these may be regarded as teratomata); third, tumors of the first or second class which in some part of their structure are malignant and metastasize in other organs.

The first class constitutes a very large proportion of the reported cases. They occur as simple unilocular cysts, as unilocular cysts with diverticula of varying size, and as multilocular cysts. The cysts are either smooth or contain polypoid excrescences of greater or less complexity. Their walls are lined by epidermis containing as a rule hair follicles and sebaceous glands. Less frequently sweat ducts are found. In one case the cyst showed no epidermis, but contained hairs, some of which were still embedded in the wall, so that it was considered that the epidermis was formerly present, but had died and desquamated.

In four cases the cyst wall consisted simply of connective tissue. In eleven cases bony plates were present in the wall,

and in an equal number bits of cartilage. Both bone and cartilage were found in seven. In five cases there were teeth either free in the cavity or embedded in the wall. In some cases there was a distinct alveolar border.

Of slightly greater complexity of structure are a few cases. That of Loewenmyer, besides a large cyst lined with epidermis, contained smaller ones lined with ciliated epithelium. The cases of Marchand and Pinders showed parts resembling thymus. In Mandlebaum's case there were vesicles identical with those found in the thyroid. In others there were cysts wholly or in part lined by cubical or cylindrical epithelium. These latter might be explained as a persistence of the stratum Malpighii of the epidermis with desquamation of the other layers.

Of the second class there have been only two cases, those of Ekehorn (Case I.) and Virchow. In Ekehorn's Case I., besides a dermoid cyst, there was a bone resembling the superior maxilla, ganglia suggesting spinal ganglia arranged between bits of bone and structures resembling somewhat foetal lung and intestine. Virchow's case showed much young striated muscle and in places suggested foetal lung in addition to areas of a sarcomatous and carcinomatous nature.

The third class is represented by three cases, those of Pinders (Case I.), Jores, and Virchow. Pinders considered his case in part lympho-sarcoma. That of Jores was in places spindle-cell sarcoma and had metastasized in the right lung. Virchow's case showed both carcinomatous and sarcomatous nodules, and had metastasized in the liver.

Contents of cysts in almost every case was a greasy semi-solid material in which hair was mingled.

Diagnosis. — A positive diagnosis can be made only when portions of the cyst contents are obtained for examination. This is possible when there is a fistulous communication between cyst and surface of body, when through a communication between cyst and bronchus some of the contents is coughed up, or when an exploratory incision or trochar puncture is made. A probable diagnosis can be made when we have evidence, in a young adult, of a solid non-pulsating

mediastinal tumor of slow progress. At the same time, owing to the rarity of this affection, it is not likely that a correct diagnosis will be made in the deeply seated tumors except where there is a history of having coughed up hair. This latter is absolutely pathognomonic of the condition, but in some of the previous cases this has been regarded as a deception on the patient's part, and given no weight in determining the diagnosis.

Treatment. — It is only through surgical procedure that a cure can be attained. Radical operation is rendered difficult by the proximity of vital organs, the frequency of extensive adhesions, and the danger of entering the pleural cavity with production of a pneumothorax. Simple drainage often proves ineffectual owing to the cyst being multilocular or to the presence of diverticula in a simple cyst.

Of the cases collected 8 were operated on. In 6 the cyst was incised and drained with or without the removal of excrescences. Two of these cases resulted fatally. That of Koerte had concomitant pulmonary tuberculosis and died from hæmoptysis. Mandlebaum's case survived for 3 weeks, though she never fully rallied from the operation. The remaining four were improved. Kückman's case 1½ years after operation showed only a small movable tumor and general condition was good. Pöhn's case was improved. Godlee's case after two years still showed fairly marked suffering. Pflanz's case was greatly improved, and when last seen six months after the last operation the fistula gave signs of permanently closing.

Two of the 8 cases operated on were cured. In the case of Bastianelli a small cyst was excised with uninterrupted recovery. Dardignac's case was drained once by himself and a second time, four years later, by Belin. Each time there was much improvement in the man's condition. Finally, one year later, Belin performed a partial pneumectomy and partial excision of cyst with marsupialization of remaining part. This resulted in complete recovery.

Though the number of cases is small the results of operation have been fairly satisfactory. In cases where pressure symptoms are becoming very evident it seems that surgical

interference should be undertaken since, without it, a fatal termination is almost certain.

Genesis. — Few subjects in pathology have aroused more interest and discussion than the question of the genesis of those tumors which are grouped under the designations, dermoid cyst and teratoma. To the earlier medical writers they represented, at least in certain parts of the body, the results of abnormal pregnancies inflicted by Heaven as punishment for some misdeed. In the latter part of the XVIII. century their origin was ascribed to a *nisus formativus*, and this explanation was for a time deemed satisfactory. To Lebert is due the credit of separating the dermoid cyst, a name given by Leblanc,[48] from the teratoma. Wilms[49] has recently concluded that the dermoids of the ovary are structurally and genetically different from those occurring elsewhere in the body. The earlier theories, incompatible with our present knowledge of the pathology and embryology of man, have given place to newer ones. The later ones have this in common; they refer the origin of the tumor to the foetal period of life.

We will first consider the dermoid cysts, as they form a very large proportion of this class of tumors in the anterior mediastinum. Ribbert[50] has shown that portions of epidermis transplanted into the abdominal cavity can give rise to cysts lined by epidermis and also[51] that bits of epidermis transplanted into the subcutaneous tissue will proliferate and line the split in the tissue in which they lie. If this is true for adult tissues, whose power of reproducing themselves is diminished, misplaced foetal tissues should show far greater capability of development. That dermoid cysts do arise in this way is generally conceded. Are there then any conditions of foetal development which would favor ektodermal misplacement in this region of the body?

As we have already pointed out, many of the cysts in the cases studied occupy that portion of the anterior mediastinum situated between the upper border of the heart and the root of the neck. Others give proof of a prior position here. We know that the heart develops in the neck region of the foetus, and later descends into the thorax. Such a descent

would be expected for other structures in the superior anterior mediastinum. This does happen in the case of the thymus. It seems justifiable to assume a similar migration for the *anlage* of the dermoid cysts.

In the neck region during foetal life we have a cycle of changes involving the branchial clefts and arches, the formation and disappearance of the sinus praecervicalis of His, the development of the thymus and the thyroid from the third and fourth branchial clefts respectively, and the overlapping of the fourth arch by the third. The sinus praecervicalis is ektodermal, the thymus and thyroid are by almost all observers regarded as entodermal in origin. However, regarding the branchial clefts, Minot [52] points out the very intimate fusion between the ekto- and entodermal layers. Thus in the neck we have great complexity of development, and conditions apparently favoring the misplacement of portions of germ layers. In other parts of the body where dermoid cysts and teratomata are frequent we find similar complexity of development.

In the case reported by Marchand distinct thymus tissue was present. In one of Pinders' cases there was tissue suggesting thymus, and associated with the other was lymphosarcoma whose origin in this region is generally referred to the thymus. In these three cases we have evidence of association in development with the thymus. That thymus tissue is not found in more cases may be due to the fact that the thymus normally disappears in early adult life.

Collenberg's case showed definite association with the thyroid, and in Mandlebaum's case vesicles were present identical with those normally present in the thyroid. Thus in a certain number of cases we have proof of the genetic association of these tumors with thyroid or thymus.

Besides these cysts to which a branchiogenic origin may be assigned, there are cysts in the lower anterior mediastinum which have no demonstrable connection with the upper anterior mediastinum. They have either migrated from the upper level, and have the same origin as the cysts there or they have resulted from portions of misplaced ektoderm caught within the thorax at the time of closure of the

anterior chest wall. Moreover this origin cannot be denied for some of the cysts at a higher level. Of it we have no definite proof, but the occurrence of presternal dermoid cysts, of which Andoly [53] has collected seven cases, somewhat favors this view, while the case of Bergmann, in which the sternum lies between two parts of the tumor connected by a fistula in the bone, strongly supports it.

For those cases, in which were found cysts lined by ciliated epithelium, it is not necessary to assume any participation of the respiratory tract in their formation. Ciliated cysts can arise in the thymus as in the case reported by Westernyk [54] and a second of Bednar's cited by the former. It is also stated that such cysts are not uncommon in animals.

The two cases, Ekehorn (Case I.) and Virchow, which have been regarded as teratomata show parts derived from all three germ layers. This class is at present generally regarded as originating from (1) a foetal inclusion, (2) from a fertilized polar body, or (3) from a group of cells very early in segmentation separated from the developing ovum. Though there is some evidence for these theories in experimental work on the lower forms of life, they remain for man scarcely more than theories. At the same time it is possible that the more complex tumors arise from misplaced elements representing all three germ layers, and this view would explain all cases as yet reported for the anterior mediastinum, since here the degree of complexity is not very great.

In conclusion it would seem that most of the tumors of the anterior mediastinum have a branchiogenic origin. For a certain number an origin resulting from the misplacement of ektoderm during the closure of the anterior chest wall cannot be denied.

SUMMARY.

1. Dermoid cysts and teratomata of the anterior mediastinum occur infrequently, generally give evidence of their presence during early adult life, and are of relatively long duration.

2. Their most frequent position is immediately behind the upper portion of the sternum. From there they may grow out into the lung or down between heart and lung.

3. These tumors may be classified as follows :

(*a.*) Tumors of ektodermal origin with the addition of some tissue from the mesoderm—dermoid cysts.

(*b.*) Tumors derived from all three germ layers—teratomata.

(*c.*) Dermoid cysts or teratomata which in some part of their structure show evident malignancy.

The first class includes a large proportion of the reported cases.

4. The coughing up of hair is pathognomonic of this mediastinal condition.

5. Cure is possible only through surgical procedure.

6. The genesis of these tumors is to be referred to the foetal period of life. The origin of most is branchiogenic. Some may result from germ layers misplaced at the time of closure of the anterior chest wall.

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XI.

A CASE OF CHOLECYSTITIS FROM WHICH THE BACILLUS MUCOSUS CAPSULATUS WAS ISOLATED IN PURE CULTURE.

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[From the Pathological Laboratory of the Boston City Hospital.]

SINCE Friedländer's pneumobacillus was isolated in 1883, numerous organisms have been described, differing from it in minor details. These were at first regarded as distinct species. More recent observers have grouped them together under the name Bacillus mucosus capsulatus and regarded the individual organisms as varieties showing slight differences from the type organism but possessing the same general characteristics.

Gradually the role which this group plays as pyogenic organisms has widened. In 1895 Etienne[1] reported its presence in fourteen different suppurative processes. In 1896 Halban[2] added several to this number. In 1899 Clairmont[3] for the first time reported its presence in a suppurative process of the gall bladder, having isolated it in association with the Bacillus coli communis from a case of pericholecystitis and cholangitis. Since his case we have been able to find no other case reported in detail though the organism is mentioned as one occasionally found in the gall bladder in cases of cholecystitis and cholelithiasis.

In the following case the Bacillus mucosus capsulatus was isolated in pure culture from the gall bladder. Cultures made from the centre of the stones were sterile.

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[Abstract from Clinical Records of the Boston City Hospital.]

E. C. Female, age 33, admitted to hospital March 6, 1901. Family history is negative. Patient has had no previous attack similar to this. She has never had typhoid fever. Until present illness she has always been in good health. About six week ago patient had an attack of severe abdominal pain and vomiting. Since then she has not been confined to her bed, and the pain has gradually disappeared. Eleven days ago patient had a second attack of abdominal pain followed by the gradual development of a tumor in the upper right quadrant of the abdomen which has persisted. She has had severe chills but no jaundice. On physical examination her tongue is moist and fairly clean. The abdomen presents on the right side a tumor about four inches in diameter, which extends up under the costal margin. This is tender and fluctuant.

Operation March 8, 1901 by Dr. Bolles. Tumor proved to be a dilated gall bladder. On opening, it was found filled with foul pus and contained about 100 gall stones, the largest of which was 2½ inches in circumference, the smallest about the size of a grape seed. No stones were found in the gall ducts. Gall bladder was washed out with salt solution and drained by means of gauze wicks. On April 2, 1901, only a small superficial granulating area remained at the site of operation. There was no underlying induration and no tenderness. Patient was discharged from hospital relieved.

Bacteriological Examination. — The material consists of a swab from the gall bladder with a small amount of pus and two gall stones 0.7 and 1 cm. in diameter respectively. Smears made from the pus and stained by Gram's method show many polymorphonuclear leucocytes and a few medium sized decolorizing bacilli.

Examined in smears from growths on different media, these organisms appear as rather short bacilli with rounded ends. They vary somewhat in length and are of a distinctly greater diameter than the average colon bacillus. They stain readily with Loeffler's alkaline methylene blue and decolorize by Gram's method of staining. Stained by Welch's method they show a distinct capsule somewhat thicker than the diameter of the bacillus. When examined in smears made from the body-fluids the capsules are very distinct and readily demonstrated. The bacillus is non-motile.

Cultures. (1.) — Beef-blood serum — incubated for 48° at 37° C. Along the streak there is a luxuriant, slightly raised, moist, yellowish white growth which is quite viscid.

In dilutions it grows on the suface of the media as round, slightly elevated, moist, yellowish white colonies.

(2.) 1% glucose nutrient agar, — inoculated while melted and incubated for three days at 37° C. There is an abundant growth diffusely scattered throughout media. No gas bubbles are formed.

(3.) Nutrient gelatine, — incubated for three days at room temperature. Along stick there is an abundant growth with a distinct *nail-head*. Latter is very viscid and when touched with a platinum needle a large part of it comes away with needle and is disintegrated with difficulty in making a smear in a drop of water.

(4.) Glucose-free nutrient bouillon, — incubated for five days at 37° C. There is an abundant growth. No indol reaction is given.

(5.) Fermentation tube, 1 % glucose nutrient bouillon, — incubated for five days at 37° C. There is a free growth and no gas production. Fluid in bulb of tube is acid.

Pathogenesis. A brown mouse inoculated at root of tail. with 5 minims of a 24° bouillon culture is dead in 24° and the original organism found in smears from his blood.

Bacteriological Diagnosis. — Bacillus mucosus capsulatus.

Gall stones. Cultures were made from the centres of two stones after splitting them with a sterile knife. Three of the cultures were sterile. One showed Staphylococcus pyogenes albus, probably a contamination.

Bacteriological Diagnosis. — Sterile.

The absence of organisms in the stones suggests that the infection of the gall bladder by the Bacillus mucosus capsulatus occurred after the stones were formed, probably by extension up the common and cystic ducts.

XII.

A CASE OF GLIOMA OF THE FRONTAL LOBE.

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[From the Pathological Laboratory of the Boston City Hospital.]

(*a.*) CLINICAL REPORT.

M. S., 24, single, born in Russia of Jewish parents, a tailor by trade, was admitted to the Boston City Hospital, November 28, 1900, with complaint of six months' constant headache, growing dimness of vision, and latterly blindness. The dilated pupils did not react to light, the pulse was slow and full, the reflexes increased. Little observation was possible, as the patient was discharged the next day, refusing treatment.

Less than three months later, February 17, 1901, he was readmitted with complaint similar plus some vomiting. Still well developed and nourished, the patient showed same conditions as at first admission plus marked lateral nystagmus and slight left facial paresis. The headache came in attacks, during which the pulse might disappear at the wrist, and morphia was powerless. February 28, 1901, the right lateral ventricle was tapped, and about 15 cc. serum withdrawn. The dura regained its pulse. There was good recovery from ether. By March 9, the wound had closed, and the patient was even comfortable for days at a time. But, by the last of the month, the headaches returned.

April 8, 1901, increase of knee-jerk and ankle-clonus was noted upon left side. April 14, the reflexes on right side were more marked, and the tongue showed slight tendency to a leftward direction. April 29, the hand grasps had become weak, the intelligence was retarded, the tongue

deviated to the right, the reflexes were lively on both sides (ankle-clonus and knee-jerk greater on left than right), there was tendency to fall to the left on standing.

May 3, exploratory operation upon the left lobe of the cerebellum was discontinued by reason of hæmorrhage from the mastoid vein. May 5, the operation was completed: exploration of left lobe of cerebellum with director; no evidence of solid tumor was found. A small portion of cerebellum was sent to the pathologist. The wound was partially closed and packed with iodoform gauze. The patient made good recovery, requiring moderate stimulation.

Unconsciousness, stertorous or normal respiration, rigidity of extremities, pulse of good quality though occasionally intermittent, reflexes as before operation, with some hernia cerebelli and serous discharge, characterized the remaining nine days. At 5 P.M., May 14, 1901, the patient became pulseless, failed to rally, and died at 10.10 P.M.

Clinical Summary.

Headache, dimness followed by loss of vision, about 6 months. Vomiting, lateral nystagmus, left facial paresis, tapping of right lateral ventricle at end of 3 months. Some relief, variable reflexes, increase of reflexes usually more marked on left, tendency to fall to left, with exploratory operation upon left cerebellum at end of 2 months, 5 days. Death after 9 days. Duration of disease about 1 year.

(*b.*) AUTOPSY FINDINGS: GROSS.

Examination of head alone was granted, and was made eighteen hours after death. Following is a description of the brain in gross, taken from protocol:

Weight, 1,355 gms. Spread on a board, the brain shows smooth convolutions, flatter than normal on both sides. The right hemisphere looks larger than the left. The right anterior pole advances 1 cm. beyond its fellow, and the lateral dimensions of the right hemisphere at a point 10 cm. from the tip of the frontal lobe, are increased by 1.5–2 cm. No greater flattening is evident in the prefrontal region than elsewhere in the hemispheres.

At a point in the right parieto-occipital region, 10 cm. from the longitudinal fissure and 8 cm. from the tip of the occipital lobe, is an area 1.5 cm. in diameter, corresponding with trephine-hole, the tissue of which presents a roughened surface.

The region of the left half of the cerebellum is occupied by a dark red grumous mass of disintegrated cerebellar tissue, in which thready remains of vessels are the only recognizable elements. The disintegration of the cerebellum has proceeded anteriorly to within 1 cm. of the anterior border of the left lobe, internally to 0.5 cm. from the vermis. The intact right cerebellum exhibits well-marked pressure-ring 1 cm. concentrically from the medulla.

On section (by Virchow's method), the left ventricle presents a moderate increase of clear fluid, perhaps 30 cc. Section of the right hemisphere from behind lays open a cavity normal posteriorly; but, at a point 10 cm. from the tip of the frontal lobe the knife meets with an obstruction. Skirting a tumor mass, 6 cm. from median line and 6 cm. in antero-posterior dimensions along its outer border, the knife enters anteriorly a cyst-like cavity in the prefrontal region; filled with a greenish-yellow, smooth mass of clot. The coagulum is easily disengaged from the cavity except posteriorly and below, where there is a knob of dark blood-clot which pulls away from below the tumor mass leaving a roughened surface. On removal of the clot the tumor mass proves to be gourd-shaped with the neck directed outwards and forwards in the horizontal plane.

Dimensions of mass follow:

From before backward, including neck	6.5 cm.
From before backward, internal to neck	4.5 "
From above downward, through neck	2.0 "
From above downward, through body	5.0 "
Laterally, through neck	2.0 "
Laterally, through body	5.0 "

The cyst-like cavity, likewise gourd-shaped, has its neck directed posteriorly and internally to the neck of the tumor mass. The prefrontal convolutions are thinned to 0.75–1.0 cm.

The tumor and the cyst thus occupy the whole right prefrontal region, thinning out the convolutions somewhat more anteriorly than laterally. The body of the tumor mass appears to lie wholly below the corpus callosum, while the neck fuses with the callosum fibres as they play out anteriorly. So also above, the convolutions are thinned out more anteriorly than posteriorly, by reason of the restraint afforded posteriorly by the corpus callosum. Below and internally, the tumor has replaced the anterior portion of the nucleus caudatus for a distance of 2 cm., leaving a wide rounded end with a somewhat granular surface from which the mass has contracted away. There is apparently no gross pathway between the body of the lateral ventricle and the cyst.

Two coronal sections through tumor mass show firm, gray, fascicular surfaces, easily distinguished from the enclosing white matter, with suggestion of concentric arrangement of fascicles. Within are flecks of dark, softer material, suggesting infiltration with blood; but the core is still fairly firm. The anterior section (through the neck) shows inferiorly small, white, gritty granules of calcification, and superiorly small masses, 0.25–0.5 cm. in diameter, of an orange color, but consistency unchanged. On section the outermost portions of the tumor retract somewhat like those of uterine fibromyomata.

Pathological Summary — Gross.

Hard glioma in anterior half of right hemisphere, now evident as mass mainly subcallosal, effacing anterior horn of ventricle. A few hæmorrhagic cysts and areas of infiltration with blood. Some pigmentation. Calcification in anterior portion, adjacent to corpus callosum. Large cyst, in connection with tumor, occupying whole right prefrontal region below a thinned cortex. Flattening of convolutions throughout both hemispheres. Operation on left lobe of cerebellum.

(*c.*) FINER STRUCTURE.

Although a variety of methods was employed in demonstrating the nature of the mass, in this account I may

conveniently suppress all but the essential technique. For topographical work, Mallory's aniline-blue connective tissue stain serves well; with its use the fate of the so-called gliosarcoma should be sealed. For nuclear pictures and for differentiation of fibrils, Mallory's phosphotungstic acid haematoxylin (Method 1900) is effective; by slighting or omitting the last step (the discharge of red with ferric chloride) good pictures of cytoplasm likewise are gotten. Thus, with a single mordanting process (the picric acid and ammonium bichromate method), all the cell elements involved are adequately prepared. In examining the borders of the mass the foregoing methods are supplemented by Weigert's myelin-sheath stain (Pal's modification was employed). A second mordant is thus necessary. Interesting, though not absolutely differential, pictures may be obtained by the use of phosphotungstic acid haematoxylin after either Weigert's myeline mordant or his neuroglia mordant.

A needle thrust from without into the cavity of the large anterior cyst will pass through the following tissues:

i. Unaltered pia.

ii. Subpial glia of ordinary depth, but of increased closeness of texture. Many cells of the so-called astrocyte type. The fibrils are still separately visible and prefer a radial arrangement.

iii. Nerve-cell layers, less distinct than usual. Only the outermost of the large pyramidal cells preserve a radial direction; many are tilted to an angle of 45° or less, with surface of cortex. The spaces about cells are less evident than usual. A number of small oval or bluntly fusiform dark nuclei may overlie the large pyramidal cells, helping to efface the surrounding spaces. Fibrillæ are chiefly unevident in these layers, except in the immediate neighborhood of vessels. There is no corresponding increase of cells; and it may be suspected that the fixative or the mordant gained better access by way of the perivascular spaces (whether natural or afforded by contraction post mortem).

iv. Layer of glia cells and fibrils, of somewhat looser texture than the overlying layers. Large numbers of rather thickly set, round or oval, vesicular nuclei occur, about

twice the size of lymphoid nuclei, with more sparsely scattered central dots of chromatin. Nearer the cyst cavity, clear spaces become more manifest; the glia nuclei become larger; there are many comparatively thick-walled vessels; and there is a transition to a definitely tangential arrangement of fibrillar fascicles, which form spindle-shaped cages in which lie nuclei themselves more fusiform. Pal preparations exhibit a gradation from normal at the outer portions of this layer to complete absence of myelin-stain in the region of the large vessels which mark the edge.

v. Dense layer of fibril fascicles with relatively few cells, evident in gross as an opaque blue line (in Phosphotungstic preparations), somewhat narrower than, for instance, the layer of subpial glia.

vi. Coarse meshed layer of cells which are relatively larger and of fibrils which are relatively larger, though fewer, than those of superficial layers.

The cell-types in this layer are:

(*a.*) Round, oval or fusiform vesicular nuclei having definite nuclear membrane upon which may be deposited dots of chromatin, surrounded by an amount of protoplasm enormously variable, usually an oval, rimless collection of material of "ground-glass" texture. This cytoplasm is occasionally pulled out into one long, pale, tapering streamer.

(*b.*) Much larger cells, having nuclei usually smaller, centrally or at least not eccentrically placed, with chromatin dots often murally set upon nuclear membrane, and a cytoplasm peculiar in possessing a coarse evenly distributed network.

(*c.*) Still larger cells with "ground-glass" cytoplasm, and eccentric nuclei, which may be vesicular, but are more likely to show chromatin contorted in polymorphous fashion within otherwise pale karyoplasm. These sometime include pigment granules.

The fibrils are large and usually tangential in arrangement. They may be gathered into bundles, giving an appearance of cleavage rather than branching, and the ends often suggest frayed ends of wire cable. They always present more sharp angles than fibrin-threads as if inelastic and

bent by some external force. The cut ends everywhere suggest at first sight a precipitate.

Masses taken at random from various portions of the tumor show tolerably uniform pictures. The blood-supply is obtained from comparatively thick-walled vessels, having a definite adventitia whose outer limits are well seen in aniline-blue preparations. The space due to contraction in fixation is brought out sharply by the red field of glia surrounding. In the case of larger vessels the fibrils approach the adventitia ray fashion, just as they approach the pia. The fascicular growth of the tumor is fairly evident in sections with the unaided eye. Cell-type (*a.*) is the dominant type. Cell-type (*b.*) affects long, clear areas not supplied with fibrils; it may be suspected that (*b.*) is a modified endothelial cell; but the vacuolation is in places so regular as to simulate an intrinsic structural character. The rarity of cell-type (*c.*) in the body of the tumor suggests that it is a product of œdema in the cyst-lining. It is somewhat less sure that cell-type (*c.*) is in all cases a derivative of cell-type (*b.*). The adventitia of the larger vessels contains many lymphoid cells, some of which are beginning to resemble cell-type (*b.*).

Sections from various portions of frontal cortex show gliosis similar to that external to cyst.

Sections at various points through right crus cerebri show no degeneration by the Weigert-Pal and Marchi methods.

Pathological Summary: Microscopic.

Uniformly fascicular and not over vascular mass, presenting the finer structure of adult neuroglia (fibrillated). Many groups of what are probably modified endothelial cells occurring in spaces without lining, and probably derived from perivascular lymph-spaces. No recognizable ependymal elements in œdematous lining of cyst. Dense corona composed of relatively few cells and enormous numbers of fibrillæ tangentially set, underlying zone of œdema. Outside corona, gradual transition to region of myelinated nerve-fibres — persistent shell of centrum semiovale. Gliosis of overlying cortex.

(*d.*) REMARKS.

The list of gliomata, so-called, affecting the frontal region is somewhat long. I have thought proper, however, to exclude from the following compilation cases which gave no evidence of examination with modern methods for the demonstration of neuroglia. Thus, if "histologically the growth appeared to be a glioma with considerable connective tissue stroma present," the case does not here appear. "Gliosarcomata" do not appear, despite the remark of the Malherbes (1900) that glioma "n' a pas de caractères bien tranchés." The following are cases of frontal glioma, suitably reported for present pathological purposes.

1. Baumann-Ströbe. Baumann ('88). Restudied with Phosphomolybdic Acid Hæmatoxylin. Strœbe ('95). Neuroglioma ganglionare: "ganglion-cells" in groups, some binucleate, about the size of anterior horn cells, of irregular distribution in right frontal cortex of a child, whose only clinical history is that of "*Zahnkrämpfen.*"

2. Buchholz ('91). Glioma telangiectodes of white matter of right frontal region, with involvement also of left hemisphere by extension beneath third ventricle. Histologically: portion of tumor in frontal region, highly vascular and composed of large round or polygonal cells (sarcoma-like) surrounded by "*Spinnenzellen;*" tumor elsewhere shows admixture with nerve-elements. Nowhere definite limits. Adventitia of vessels shows "round-cell infiltration."

Clinically: course of 4½ months in patient of 35 years; apathy, increased reflexes, sluggish pupillary reactions, *Stauungspapille*, slow pulse, vertigo, spells of unconsciousness with clonic contractions of extremities, vomiting, death in coma.

3. Bruns ('92). Disintegrated glioma of white substance of second and third right frontal convolutions, affecting anterior portion of lenticular nucleus (internal capsule not destroyed) and extending to anterior edge of anterior central gyrus at level of lower portion of arm centre. Clinically: disturbance of equilibrium (compared with symptoms of cerebellar lesions), ataxia, paralysis of left hand, tendency to *Witzen und Wortspielen*, pain and tympanites over region of second and third frontal convolutions.

4. Raymond ('93). "Gliome neuroformatif," size of orange, occupying the inner aspect of left frontal lobe, giving rise to cerebral pressure and pressure-atrophy of cortex, with degeneration of white substance of left frontal lobe and of association-system appertaining.

Clinically: violent headache with epileptiform crises, dementia (without delirium or motor disturbance), inability to walk or stand.

5. Pfeiffer ('94). Ependymal gliomatosis of lateral ventricles, with processes advancing into right frontal and left occipital lobes. Clinically: in man of 32, exophthalmos, head- and neck-contractions, tremors in hands, clonic contractions of extremities giving place later to tonic contractions, weakening and loss of knee-jerk on left side, optic atrophy, abducens palsy, disturbance in functions of third nerve, progressive loss of intelligence.

6. Bouveret ('95). Glioma, size of pigeon's egg, in white substance of right frontal lobe, within zone of softening. Clinically: course of 8 days, with signs of hemiplegia in male of 56 years.

7. Bouveret ('95). Glioma, size of nut, above and anterior to caudate nucleus, with yellowish firm centre and gray-pink, soft, vascular periphery. Clinically: signs of hemiplegia.

8. Obici ('95). Glioma in second left frontal convolution. Clinically: variable course of eight years, — headache, convulsions, remissions, in fifth year right facial paralysis with right-sided hemiparesis, anosmia, amaurosis, optic atrophy, operation in sixth year, removal of tumor, hernia cerebri, death 14 months later from abscess at site of operation.

9. Henneberg ('97). Diffuse frontal tumor, grown into lateral ventricle. Of varying histological character: "sarcomatous" in places, with occasional softened areas. Certain cavities, lined with ependyma and probably formed by projection of glia masses into ventricular cavity with later pinching-off of communication (though possibly formed by metaplasia).

10. Thomas-Hamilton ('97). Neuroglioma involving "area of termination of white matter in frontal region;" fibrillae not demonstrated. Clinically: diagnosis not made, probable duration 6 years, signs of irritative lesion of left motor region. Jacksonian epilepsy followed later by palsy of affected limb.

11. Taylor, E. W. ('98). Infiltrating glioma of first and part of second left prefrontal convolutions: "somewhat cellular growth with numerous fibres." Ganglion-cells in places still made out. Myeline not wholly destroyed. Clinically: vertigo, five years later irregular epileptiform convulsions, neurasthenia, morbid fears, increasing severity of symptoms, sudden death in man of 36. No optic neuritis.

12. Neurath, Rud. ('99). Neurogliosis Gangliocellularis Diffusa: cartilage-like sclerosis in lower portion of second and third frontal gyri. Characteristic elements, large hyaline cells, with (often two) very large nuclei, and provided with processes. Perhaps derived from ectodermal elements before differentiation into neuroblast and glial element. Also large squamous cells either without nucleus or

with faint nucleus. Clinically: no symptoms, unless accentuation of post-scarlatinal hemiplegia in child of 2½ years.

13. Bonome, A. ('01). Glioma of white substance of right frontal region (Case Zaniboni). Contains characteristically Bonome's cell-type 3 : large, irregular cells with processes and one or more granular nuclei.

A series of fourteen cases warrants merely qualitative notice.

Frontal gliomata, judging from those so far reported, are not large, affect spheroidal shape with ill-defined borders, depend for color upon contained blood (often in normal channels only, but characteristically in areas of infiltration, sometimes in shape of blood-pigment), and exhibit degrees of consistency quite various, but usually firmer in places than the surrounding tissue. Cysts are common. Gross signs of pressure are shown, commonly by flattening of convolutions, by evident bulging, or by internal hydrocephalus and pressure-ring about cerebellum.

So far as origin goes, they occur in the white matter scarcely more often than in the gray ; and the crucial cases where ependymal origin is indicated are few (Pfeiffer, Henneberg).

Histologically, the pictures are occasionally quite nondescript (though cases where the resemblance to sarcoma was too close I have excluded). The *Spinnenzelle*, astrocyte, or what with modern technique is more properly a cell within a sort of cage of fibrillæ, is the characteristic finding. In the absence of fibrillæ there must always remain some doubt as to diagnosis. Examination of sarcoma elsewhere in the body with the aniline-blue connective tissue stain always shows a well-marked fibrillar (collagenous) intercellular substance or a reticulum. By this method, it should be possible to differentiate between sarcoma and cellular glioma of the brain. Elements simulating ganglion-cells are occasionally found (Baumann-Stroebe, Neurath, Bonome?). Lymphoid infiltration of adventitia is found (Buchholz, Southard). Gliosis elsewhere than in the tumor is occasionally found. Pressure-atrophy with loss of myelin is found according to the area destroyed.

The clinical aspects are variable, and so far as they do not hang upon simultaneous affection (by tumor, by direct or indirect pressure) of the adjacent motor and (on the left side) speech areas, almost uninstructive. Moria (*Witzelsucht*) and "cerebellar" ataxia seem the nearest to positive and intrinsic symptoms; but these are certainly inconstant. Perhaps the best case surgically is that of Obici. The most luminous diagnosis seems to be that of Bruns. Here the localized pain and tympany conspired with the ataxia, of cerebellar type, to secure good localization ; and the affection of the motor region was a fortunate auxiliary, especially in its slightness. The diagnosis was made of gumma affecting the area afterward found gliomatous.

I may here thank Drs. W. P. Bolles and H. W. Cushing for the clinical records of the case, Dr. J. J. Thomas for suggestions, and Dr. F. B. Mallory for kind supervision of the work.

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XIII.

REPORT OF A CASE OF ACUTE LOBAR PNEUMONIA, DUE TO THE BACILLUS MUCOSUS CAPSULATUS.

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The case here reported is of peculiar interest in that the bacillus mucosus capsulatus was the only organism found in relation with the pneumonia. Organisms of the same class have been found alone or in combination with others in a variety of pathological processes (Howard[1]). In the course of routine work in this laboratory cases have been reported where this organism has occurred in connection with other pathogenic organisms (Curry[2]).

In this instance it was possible to rule out, as etiological factors, all other known pneumonia-producing organisms, therefore a report of the case with a full description of the organism present seems justifiable.

The patient, a male, aged 53 years, entered the City Hospital, July 8, 1901.

Family History. — Negative.

Past history of measles, mumps, pertussis, and variola in his youth. In '65, while in the army, he contracted dysentery, which has troubled him more or less ever since, especially in the summer time. Fifteen years ago he had pneumonia. For five years he has had neuralgic headaches, which have been more frequent of late. Denies venereal.

Present Illness. — Four days before admission, after drinking considerable whiskey and iced water, was so overcome by "heat" that he went to bed. The next day he had a sharp headache and pain in the right side. On the day following

he had considerable cough and dyspnœa, with moderate whitish expectoration and was not able to retain his food. No chill.

Physical Examination. — Pulse regular, equal, fair volume and tension. Arteries atheromatous. Second pulmonic accentuated. Over the whole right back (most marked from spine of scapula down) the percussion note is dull with flatness at the base. Over this area the respiratory sound is diminished, and from two finger-breadth above angle of scapula to base is entirely lost as is also tactile fremitus and vocal resonance. There is dulness in right axilla. Right front resonance is of fair quality. In the right axilla and lower back are fairly numerous medium moist rales. On the left, resonance and respiration normal. Leucocytes 33,800.

Urine acid, sp. gr. 1011, slight trace albumin. Sed. occasional cast and blood globule.

Temperature. — On entrance 103°, falling to 101°, where it remained with only slight variation until death. The day following entrance the patient became delirious in the afternoon. Pulse remained good. He failed during the night and died at 5.20 A.M.

AUTOPSY.

The autopsy was performed 17 hours after death. The following is an abstract from the protocol. Body of a fairly well-developed, rather poorly nourished man, 53 years of age. Body length 175 cm. Body warm. Rigor mortis well marked. No lividity. No œdema. Pupils slightly contracted, the right being somewhat smaller than the left. Thorax flat and clavicles prominent.

Peritoneal cavity. Appendix very small and tied down by numerous old adhesions. The distal extremity is obliterated. Numerous firm fibrous adhesions everywhere in peritoneal cavity, most marked in region of liver and gall bladder. No fluid in cavity. Omentum adherent to ascending colon and coecum.

Pleural cavities: Right contains about 50 cc. of blood-stained fluid. No fluid in left cavity. Right lung firmly bound down by numerous fibrous adhesions. Behind and

extending into the right lung is a cavity filled with mucilaginous, mucoid material, fresh examination of which shows a pleomorphic bacillus, which gives a wide capsule with Welch's capsule stain and which decolorizes by Gram.

Heart. Slight sclerosis of aortic valve. Otherwise normal.

Right lung. Surface except near apex roughened by numerous fibrinous tags. Over the same portion the parietal and visceral pleuræ are adherent. Lung is voluminous and solid. Cut surface of lower lobe gray and finely granular; on pressure blood stained mucoid material exudes; on gentle scraping a mucilaginous material adheres to knife. Section of middle lobe similar to lower, but reddish gray in color, Upper lobe deep red, crepitant; on deep pressure innumerable blood-stained bubbles exude. Along outer border of lower lobe the lung tissue is deeper gray and very friable. Without using much force the finger can be passed about in lung substance in irregular cavities containing mucoid material. This area is roughly triangular in shape measuring 19 cm. on border and extending to a point in centre; the sides of the triangle measuring 11 cm. above and 15 cm. below. There is a sharp line of demarcation between the lobes.

Other organs not remarkable.

Anatomical Diagnosis. — Acute lobar pneumonia (Bacillus mucosus capsulatus), middle and lower lobes of right lung. Chronic adhesive pleuritis. Chronic adhesive peri-appendicitis. Simple cyst of kidney. Arteriosclerosis.

Histological Examination.

Tissues fixed in Zenker's fluid, imbedded, and cut in paraffin, stained with Unna's eosin-methylene blue and with Gram's stain.

Right lung, lower lobe: All the air spaces are filled with a cellular exudate in which is a considerable amount of fibrin. The fibrin is mainly in masses of coarse threads near the walls of the air cells. A delicate meshwork of fibrin runs everywhere through the exudate. The cells of the exudate are largely polymorphonuclear leucocytes. A considerable

number of large cells having an oval or horse-shoe vesicular nucleus, are also present. The latter cells are frequently phagocytic for leucocytes and red blood corpuscles. Short, medium sized, and long bacilli are present in great numbers, some free, some included in cells of the phagocytic type.

Middle lobe. The air cells are all more or less completely filled with a cellular exudate. The bronchi are without epithelium and are also filled with cellular exudate. In the air cells remote from the blood vessels there is little or no fibrin, while in those contiguous to vessels there is a marked fibrin net-work along the walls. In places the fibrin threads radiate from a point on the wall of the air cell. This point is usually near a vessel. Where the fibrin is more abundant it is spread along the wall, but in no case does it run all through the air cell as a net-work. The cell exudate is composed largely of cells whose nuclei do not stain well. They are of the endothelial type. Among these cells are a considerable number of polymorphonuclear leucocytes. In many places large cells with pale eccentrically placed nuclei are found which have protoplasmic inclusions. The cells of the exudate are evidently much degenerated, but in places enough nuclear structure remains to indicate that the bulk of the exudate is of the so-called "endothelial" cell type. Everywhere in the air spaces are innumerable large bacilli which stain faintly. They are moderately stout rods of very variable length. Some are little more than three times as long as broad, others are almost filamentous. No diplococci are to be found. Many of the vessels contain fibrinous plugs.

Upper lobe. In the air cells is a considerable exudate composed of acidophilic fine granular material in which are a few cells, mostly "endothelial," containing greenish-black pigment. The vessels are markedly injected, particularly the capillaries in the walls of the air cells. In places these capillaries are filled with a close mesh work of fibrin. Fibrin is to be found in small amount all through the section. In one small bronchus the epithelium is partially stripped, and beneath it are a considerable number of polymorphonuclear leucocytes. Under the basement membrane of the same bronchus and in the peri-bronchial tissue are many leucocytes.

Left lung, lower lobe. Air cells contain no exudate. There is a considerable amount of greenish-black pigment in the fibrous septa (anthracotic). In some of the air spaces the infundibula are dilated in such wise as to suggest a low grade of emphysema. Section of the lung stained by Gram's method show no pneumococci or other "Gram staining" organisms. The bacilli described above take the counter stain.

Spleen. The trabeculae are not prominent. The Malpighian bodies are normal, though very small in size. The small arteries have a slight amount of hyaline material in their walls. In the pulp the reticulum is prominent. The meshes of the pulp contain much blood, many leucocytes (polymorphonuclear), the majority of which are degenerated, and a few plasma and lymphoid cells. Endothelial cells are present, but not numerous.

Liver. The liver cells contain medium-sized and large vacuoles. This condition is most marked at the periphery of the lobule. The process is not extensive in any place. About the central vein of the lobule the liver cells are large and contain much fine granular material. Vessels, connective tissue and bile ducts normal.

Kidney. The glomeruli are large, but the capillary loops are patent and there are no abnormal cells present. The cells lining the capsule of Bowman are frequently swollen and contain fine granular material and often hyaline droplets. In the convoluted tubules the epithelium is swollen and contains much fine granular material. In places, particularly near the glomeruli, the cells contain hyaline droplets. The nuclei of all the tubules stain unevenly, some are normal, others take an even and deep nuclear stain. Circular reticulum is present in all the tubules. In some tubules the epithelium is more or less detached. Fine granular casts occupy the lumina of a few of the straight tubules. In the pyramids there is a considerable diffuse increase of connective tissue. In the cortex the connective tissue is in bands which wander about and surround slightly atrophied tubules and glomeruli. In one place is an area of round cell infiltration. Vessels normal.

Bacteriological Examination.

Smears were taken from the cut surface of the right lung. Cultures from the organs were made in the usual way upon opaque Loeffler's blood serum.

Right lung. Six cultures from different parts of the lung. Abundant growth of bacillus mucosus capsulatus found in every tube. Two of the cultures were contaminated by a spore bearing bacillus.

Left lung. Two cultures, pure growth of bacillus mucosus capsulatus in each.

Spleen. Bacillus of the colon-typhoid type and a large spore bearing bacillus in chains which stained by Gram.

Liver. B. coli communis in pure culture.

Kidney. B. mucosus capsulatus and a contaminating bacillus.

Smears from the lung were stained by Gram and by Welch's capsule stain. There were found many leucocytes, most of which showed evidence of degeneration, also numerous large cells with single nuclei. Great numbers of stout medium length bacilli were present. The organism decolorized by Gram and with Welch's stain a broad capsule could be demonstrated. No cocci were found in the smears.

STUDY OF ORGANISM.

The term bacillus mucosus capsulatus has been used both generically and specifically to designate an organism or one of a group of organisms which have a common morphology and a close resemblance in cultural characteristics, but which differ considerably in pathogenicity, in their action on certain media, and in their acid and gas production. Strong[3] divides these organisms into two groups, the classification being based chiefly on their gas and acid production.

Group I. — Friedländer's group — contains the Bacillus Pneumoniae Friedländer, the Bacillus Ozaenae Fasching, the Bacillus Mucosus Capsulatus or B. Sputigenus Crassus, the Bacillus of Wright and Mallory, and the Bacillus Rhinoscleroma.

These show the following characteristics: a primarily colorless growth, whitish when old. Capsules easily stained appearing only in tissues and exudates. Pseudo-capsules occasionally on artificial media. Gas production most abundant on saccharose, slightly less on glucose, little or none on lactose. Little or no acid on lactose. Milk not coagulated.

Group II. The aerogenes group. This includes the bacillus of Pfeiffer, of Kruse, and the Aerogenes. They form permanently whitish colonies; the capsule is difficult to stain and there is no pseudo-capsule. Gas production is constant and abundant on all three media. Acid, equal amounts in all three media. Milk is rapidly coagulated.

The organism recovered from the present case gave the following cultural characteristics:

In smears from fresh tissue the organism appears as rods of variable length. Sometimes these rods are so short as to be of oval form resembling a coccus. More frequently they are two or three times as long as broad with rounded ends and often appear in pairs or short chains. Sometimes they appear in long rods ; 3 microns or more in length. By Welch's capsule stain a thick oval capsule can be demonstrated. This capsule also stains (Gram) diffusely in a smear from litmus milk. It cannot be made out definitely, however, on other sub-cultures, although there is a mucoid substance about the rod which takes the stain. (The pseudo-capsule described by Strong.)

Cultural Characteristics.

Blood serum. — After 24 hours at 37° C. the colonies appear as a translucent, moist, confluent, colorless, mucus-like growth. Sometimes the colonies appear as mucus-like transparent, round, elevated drops varying in size from a pin head to 7 mm. in diameter. The colonies are stringy and can be drawn out into threads with the platinum wire. The water of condensation is cloudy, viscid, and stringy.

Glycerine Agar. — Stab cultures after 24° show a white line of growth along the line of stab with abundant gas production. Old cultures give a peculiar stale odor; the

media turning a brownish color while the growth retains a milky white appearance.

Gelatine. — A grayish white growth along the line of the needle is seen after 24° in stab cultures. At the surface of the cultures is a small knob-like growth which spreads after several days as a diffuse raised irregular grayish white area. The gelatine is not liquefied.

Potato. — A yellowish gray, viscid growth spreading more at the bottom than at the top is seen after 24 hours both at room temperature and at 37° C. After a few days the water of condensation is milky white, thick and stringy.

Bouillon. — At the end of 18 hours the bouillon is distinctly clouded. Later it becomes stringy and viscid. A hanging drop from the young culture shows absence of motility.

Glucose Free Bouillon. — Does not give the reaction for indol.

Litmus Milk. — Milk is acidified and coagulated in from 3 to 5 days. The coagulum is solid, and of a pink color with a white stratum at the bottom of the tube.

Gas Production. — Fermentation tubes, both at room temperature and at 37° C, give the following results:

The gas replaces 55 per cent. of the media in the long arm of the tube in glucose, 67 per cent. in saccharose and 50 per cent. in lactose.

Acid Production. — The amount of normal Na. OH. solution necessary to acidify 1 c.c. of a bouillon culture was for glucose $\frac{1}{17}$ c.c. for saccharose and lactose $\frac{1}{12}$ c.c.

Composition of Gas. — This could be only roughly estimated by addition of an alkali for C O_2 and by ignition for H. The proportion of the H to the C O_2 may be approximately stated as 1 to 1 for the glucose and lactose and slightly less for saccharose.

Pathogenicity.

One mouse and twelve guinea-pigs were inoculated with bouillon culture of the organism. In each case (except one pig inoculated in muscle of leg, which is alive at this writing) the organism was recovered in pure culture. In all sub-

cutaneous injections smears from the point of inoculation showed the organism. In every case the capsule could be readily demonstrated by Welch's capsule stain.

A half c.c. of twenty-four-hour bouillon was injected into the peritoneum of 2 pigs, into pleural cavity of 2 pigs, under skin of flank in 2 pigs, under skin of back in 3 pigs. A suspension of a loop full of the 24-hour bouillon culture in sterile bouillon was injected in 5 c.c. amount into the peritoneum of one pig, into lung of 2 pigs. One pig injected with the 24-hour culture was killed for fresh tissue after 24 hours.

All the other pigs and the mouse died within 24 hours, with the exception of two of those inoculated under the skin of the back. These died after 5 and 6 days respectively.

The lesions found were peritonitis, pleuritis, pericarditis, and local abscess. The peritonitis was present in all but one case regardless of where the inoculation was made. In the one case without peritonitis the culture was injected into the lung.

SUMMARY.

We have an organism appearing as rods of various length which decolorize by Gram, and show by Welch's capsule stain a broad oval capsule in smears from fresh tissue and occasionally a pseudo-capsule on sub-cultures. It grows as a colorless moist growth on blood serum. It does not liquefy gelatine. It is non-motile. It does not produce indol. It acidifies and coagulates milk, though very slowly. It produces gas fairly abundantly and constantly on glucose, saccharose and lactose media. Its acid production is also marked and fairly constant. It is pathogenic for mice and guinea pigs.

It is to be classified as belonging to the Friedländer group of Strong.[3]

In relation with this case especial care was taken to avoid overlooking any pathogenic organism, especially the micrococcus lanceolatus, if it should be present, and the following rules were carefully observed:

(1.) Cultures on blood serum were taken from several areas of the affected lung, from the spleen, liver, and kidney.

(2.) Cover-slip preparations were made from various areas of the affected lung and stained both by Welch's capsule stain and by Gram.

(3.) Sections of the lung and other organs were hardened in Zenker's fluid and alcohol and stained by Gram-Weigert and methylene blue.

(4.) Inoculation of animals was thoroughly carried out.

All these precautions failed to show the presence of any pathogenic organism except the one described. Therefore we summarize this case as one of acute lobar pneumonia involving the middle and lower lobes of the right lung and due alone to the bacillus mucosus capsulatus.

We wish to express our indebtedness to Dr. Henry Jackson for the clinical history of the case, and to Dr. F. B. Mallory for suggestions and assistance in reporting the pathological side.

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2. Curry. Bacillus Capsulatus with reference to its connection with Acute Lobar Pneumonia. Journal of Exper. Med. vol. V, p. 169.

3. Strong. A Study of the Encapsulated Bacilli. Journal of the Boston Society of Medical Sciences. Vol. III, p. 185.

XIV.

ACUTE DEGENERATIONS OF THE NERVOUS SYSTEM, THE MUSCLES, AND THE HEART IN DIPHTHERIA. ADDITIONAL CASES.

H. S. STEENSLAND, M.D.

[From the Pathological Laboratory of the Boston City Hospital.]

IN the ninth series of the Medical and Surgical Reports of the Boston City Hospital[1] the results of the examination of the nervous system in a series of cases of diphtheria are reported. At the suggestion of Dr. Mallory two additional cases are here described. They show especially the wide distribution of the changes.

By combining Van Gieson's stain with Marchi's method the point of origin and the mode of extension of the changes in the nerve fibre have been followed to some extent. With Marchi's method alone appearances suggest that degeneration begins in the axis-cylinder and gradually extends peripherally until the whole of the myelin-sheath is involved. On cross section some fibres present a very small black area in the centre. In other fibres this area is larger. The extreme degree is presented by fibres that are represented entirely by a black area. Van Gieson's stain colors the axis-cylinder red within the black area of degeneration. Excellent results were obtained by using a mixture of one part of a one per cent. solution of acid fuchsin to two parts of a saturated solution of picric acid, as recommended by Mallory.

The cerebral and cerebellar cortices show no apparent degeneration. Everywhere in the central nervous system the process is observed only in the nerve fibres of the white matter. The small nerve trunks accompanying the small

[1] Thomas. Acute degenerations of the nervous system in diphtheria. Medical and Surgical Reports of the Boston City Hospital. Ninth series, 1898; page 52.

vessels in the auriculo-ventricular furrow show no involvement when examined.

Notes from the clinical and pathological records follow:

Case I. — Clinical Record, S. D. 157, 226. Duration of disease 2 weeks. Nasal voice was noted on the ninth day.

Autopsy No. 00.130. Anatomical diagnosis, œdema of the lungs, double hydrothorax, ascites, parenchymatous degeneration of the heart, liver, and kidneys. Thrombosis of right auricle. Healed pulmonary tuberculosis. The bacteriological examination shows the presence of the streptococcus pyogenes in the blood and the lungs.

Case II. — Clinical Record. S. iii, 86, 198 and S. D. 163, 108. Duration of disease 8 weeks. At the end of 6 weeks there was nasal regurgitation and nasal voice, and the knee kicks were absent. The pupils reacted normally. Death was believed to be due to degeneration of the vagi or the phrenic nerves.

Autopsy No. 00.158. Anatomical diagnosis, acute lobar pneumonia. Healed pulmonary tuberculosis. The bacteriological examination showed the presence of the staphylococcus pyogenes aureus in the pleural cavity.

The following tables represent the structures examined in each case. In every instance degeneration was found.

	00.130	00.158
CENTRAL NERVOUS SYSTEM.		
Cerebrum, subcortical fibres	+	+
Optic commissure	+	+
Cerebellum, subcortical fibres	+	+
Pons	+	+
Fibers in brain tissue about superficial origin of the following cranial nerves:		
IV.	+	
V.	+	
Spinal cord, thoracic region	+	
CRANIAL NERVES.		
I.		+

	00.130	00.158
III. At superficial origin		+
IV. " " "	+	+
V. " " "	+	+
VI. " " "		+
VII. " " "		+
VIII. " " "		+
IX. " " "		+
X. Right and left, in cervical region	+	+
XI. Right, at superficial termination in muscle	+	+
XII. Right and left, at superficial termination in muscle		+
SPINAL NERVES.		
Phrenic nerve, left, at superficial termination in diaphragm		+
Ulnar nerve, at elbow	+	
Nerve supplying muscle on ulnar side of right forearm,	+	
Anterior and posterior roots of spinal cord in thoracic region	+	
Anterior crural nerve, left	+	
Sciatic nerve, left, from thigh	+	
Nerve supplying sartorius muscle	+	
" " biceps muscle of left thigh	+	
Nerve supplying tibialis anticus muscle		+
MUSCLES.		
Tongue at superficial termination of right hypoglossal nerve	+	+
Tongue at superficial termination of right and left hypoglossal nerves		+
Diaphragm at superficial termination of left phrenic nerve		+
Muscle from ulnar side of right forearm	+	

	00.130	00.158
Sartorius muscle	+	
Biceps muscle, left thigh	+	
Tibialis anticus muscle at superficial termination of its nerve		+
HEART.		
Right auricle	+	
Right ventricle	+	
Interventricular septum	+	

XV.

A CASE OF PAPILLARY ADENOCYSTOMA OF THE THYROID GLAND.

HARRY C. LOW, M.D., *Late First Assistant in Pathology.*

[From the Pathological Laboratory of the Boston City Hospital.]

D. E., female, 49 years old. Admitted to hospital May 28, 1901. Patient had much trouble from sore throat about 25 years ago, and since then neck has remained swollen. Year after year the tumor gradually grew in size, but more rapidly in the last two years. During the last seven years she has had more or less discomfort at night with stiffness of neck, and has had some palpatation. No headache or dizziness. No loss of weight, no difficulty in breathing or swallowing.

FIG. 1.

Physical examination. The eyes are negative. Heart practically normal. In the median line of the neck is a tumor measuring about 18 inches in circumference. This extends down behind the sternum out under the sternomastoid muscles and up to the lower jaw. It extends a little further to the right side, and seems to pass underneath the right sterno-mastoid muscle. It moves on respiration, and is not adherent to the skin.

At operation (Figs. 1 and 2) the tumor was removed by Dr. F. B. Lund, under local anesthesia with 1-1000 solution of cocaine. With the patient in the half reclining posture, an incision four inches long was made from obliquely across the front of the tumor, beginning above on the right, and ending opposite the supra-sternal notch.

FIG. 2.

After peeling back the skin and platysma, and ligating the superior and inferior thyroid arteries on the right, the capsule of the cyst, which was covered with numerous large veins, was incised, and the tumor quickly and easily enucleated. The patient made a rapid recovery.

Pathological report. — The specimen consists of a tumor mass weighing 680 gms. after it had been cut in halves and about 10 cc. of fluid escaped. It measures 11 x 12 x 9 cm. It is nearly symmetrical, but on one side is slightly concave. It is covered with a firm, thin fibrous capsule which is shiny and fairly smooth, and on which there are rough fibrous shreds. There is no apparent point of attachment. The surface is white with fibrous bands and mottled with dark and bright red areas, which beneath the thin wall seem translucent. On section a moderate amount of thin, colorless fluid escapes. There are a great many cystic spaces separated by white fibrous walls. These spaces in many places contain clear fluid. The cut surface is divided by broader fibrous bands into rounded areas which are subdivided by thin fibrous walls. A greater part of these small alveoli are filled with soft yellowish material which stands above the surface like small plugs. In the centre the cysts are large and filled with fluid. The largest cystic space measures from 0.5 to 1 cm. A cross section of the tumor after it had been

hardened in Kaiserling's fluid shows that the greater part of these cysts are filled with rounded papillary projections.

Microscopical examination. — The capsule is formed of dense fibrous tissue. The growth is formed almost wholly of large cysts which are nearly filled by the very extensive papillary outgrowths from their walls. In some places these cysts are quite large, and their walls apparently broken down, and there are other parts where the follicles are small, and the papillary growth is not seen. The follicles are all lined with a single layer of apparently normal thyroid epithelial cells. There is nowhere more than one layer of these cells and there is no interstitial proliferation of the

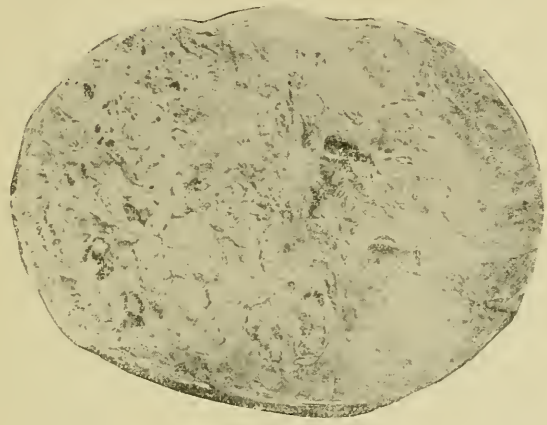

FIG. 3.

thyroid cells. The follicles are filled with mucus or empty, except that in a very few instances there is seen a small follicle filled with rather poorly staining colloid. There is more or less oedema of the stroma in places, and here one finds that the border of thyroid epithelium is rather scanty and poorly stained. The microscopical picture of this tumor is shown in Figure 4.

The tumor is a simple papillary adenocystoma. There is no evidence of any solid growth, no suggestion of malignancy. Tumors of this type do not seem to be very common in the thyroid. Wölfler was the first to describe them carefully, and but very few authors have recognized them as a class.

Pollard has reported a case of intracystic papilloma of an accessory thyroid gland. It started as a tumor the size of a pea at the upper border of the thyroid cartilage and in two years attained the size of a hen's egg, and invaded neighboring glands. This growth showed a very little colloid in places.

This case showed no signs of the symptoms of exophthalmic goitre. The apparent exophthalmos in one of the illustrations shown is not real, and was not usually noticeable.

FIG. 4. — Papillary adenocystoma of thyroid. In upper right corner a few follicles containing colloid are shown. Much of the tissue in the centre of the tumor is œdematous and the epithelial cells do not stain as deeply.

Among the seventeen tumors of the thyroid that are included in the pathological records of the hospital only two show the marked papillary type. There are three others that show a slight papillary proliferation. These show in some places a reduplication of the epithelial layers, and often an interstitial proliferation of the thyroid cells. They all show many follicles containing colloid and areas of fairly normal thyroid tissues. One of these cases showed no symptoms suggestive of exophthalmic goitre; another had palpitation,

tremor, and twitching of the muscles which may have been due to the very large heart with mitral insufficiency. In the third case there was exophthalmus, palpitation, tremor, and nervousness, but in this case there was much more colloid than in the others; there was more of the adenomatous and interstitial growth than is seen in the usual exophthalmic goitre.

Whether this papillary adenoma of the thyroid lies on the border line between the benign tumor and the carcinoma is not certain. In one of the cases of carcinoma of the thyroid recorded in the Hospital Reports we see a solid alveolar growth which is so bordered in places by a very marked papillary proliferation of the epithelial cells.

The generally well-known fact that malignant tumors develop in a benign enlargement of the thyroid agrees with this.

The various systems of classification offered for the growths of the thyroid are not complete, and the position of this tumor remains to be settled. At least it is clinically a tumor to be removed for the sake of convenience if not of its dangers as a malignant growth. Future study of these tumors may show their significance.

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XVI.

TUBULAR PERIVASCULAR SARCOMA. ITS ORIGIN, STRUCTURE AND METASTASIS.

BY H. C. LOW, M.D., *Late First Assistant in Pathology*, and F. B. LUND, M.D.

THE study of the specimens removed at operation and autopsy in the two cases of perivascular sarcoma which are here reported, brought out so many points of interest in regard to the structure of the tumors, the changes of the structures which may accompany metastasis, and the connection between the pathological findings and the clinical course of the disease, that the writers thought them worthy of the following report:

Methods. — Of the original growth in the first case we have had to make our study from the sections made at the time and stained in hematoxylin and eosin. Of the recurrence at the primary site and the tumor removed from the groin at the third operation all the tissue was saved in Zenker's fluid. At the autopsy all of the tumor and its metastases were preserved in Zenker's fluid, except small nodules in the brain which were saved especially in alcohol and formalin.

From these tissues subsequently imbeded in paraffin over 500 sections have been cut from various parts of the tumor and its metastases. The stains used have been Mayer's hemalum with eosin as a contrast, Unna's polychrome methylene blue, Mallory's connective tissue stain, and Weigert's elastic tissue stain.

The tissue and sections of the first two operations in the second case were not saved, and we use the very full description taken from the pathological records. The tissue removed at the third operation, consisting of the recurrence at the original site on the penis and the metastasis in the groin

were preserved in Zenker's fluid, and from these we have made various sections.

CASE I.

E. R., 47 years of age, married, multipara, who had just passed the climacteric, was admitted to the service of Dr. Munro at the City Hospital on September 13, 1899. About four or five months before she had noticed a smarting sensation on micturition, as the urine passed a small bunch close to the outlet of the urethra. The growth had not apparently increased in size since she noticed it, but it was tender and painful on sexual intercourse.

Examination showed a small bright red eroded tumor, close to the urethra, and between it and the right labium minus. There were also pigmented areas the size of a ten-cent piece on the inner surface of both the right and left labia minora. Except for pigmentation these areas of skin appeared normal. On September 15th under local anesthesia with cocaine one of the writers excised the tumor and closed the wound with silk sutures.

The pathological report at the time of the first operation, September 19, 1899, describes the gross appearances as a simple bit of tissue with a small dark elevation in the side which is covered with skin. The diagnosis was made as follows: "Caruncle with chronic inflammation. At one point is a small area resembling the pigmented warts frequently found beneath the skin, and which, although they histologically resemble sarcomata, are clinically but slightly or not at all malignant."

Owing to the fact that the clinical appearance of the growth was not that of a malignant tumor, but that of an ordinary urethral caruncle, and that the pathological report confirmed the surgeon in the belief of the non-malignancy of the tumor, no further operation was undertaken. That this course was a mistaken one the subsequent course of events clearly proved.

The microscopical section (Figure 1) shows rather dense aud fairly vascular fibrous tissue bordered along one side by epidermis. In the middle of this side is a nearly round nodule partly covered

with a thin epidermis. About this nodule, and especially just beneath the adjacent epidermis there is a marked infiltration of lymphoid and plasma cells. There is at one side a slight ulceration with a few polymorphonuclear neutrophiles. The nodule itself, which is in this section about two millimetres in diameter, is formed of round and spindle-shaped cells with nearly round or oval nucleus. The cytoplasm is finely granular and takes a light stain; the nuclei are lightly stained, contain many chromatin granules, and have a clearly defined membrane. There are many very typical mitotic figures in various stages.

There is a small amount of stroma between the cells, and in places it is formed into narrow bands which irregularly divide the small cell groups into more or less definite alveoli. At one side near what appears to be a growing edge there is a well-marked alveolar arrangement.

There is in places considerable granular pigment. This is not in any one part of the tumor, but is gathered in masses sometimes in the tumor cells, but more often between these cells and in the connective tissue. Along the borders of the tumor this pigment is mostly scattered about in the tumor cells. Occasionally in the centre of an alveolar group of cells is seen a large cell with irregular outline in which the cytoplasm is dotted with numerous fine round brown granules. Some of the cells, which at least in places seem to be those of the stroma, are filled with larger irregular, and darker brown granules. Where the pigment is between the cells the granules are larger and darker. The nuclei do not seem to be pigmented. The pigment cells are mostly of a long irregular spindle-shape, and when nearly round often show delicate projections extending between the adjacent cells. The nodule is not very vascular, and no definite vessels are seen.

On August 30, 1900, she was admited to the hospital again to Dr. Munro's service. The upper halves of both labia minora, the vestibule, and the clitoris were occupied by a bluish, black, elevated, irregular new growth which bled freely at the slightest touch from an eroded surface near its centre.

On August 30, under ether, an incision was made by one of the writers extending from the top of the right labium majus outside the tumor downward to below the lowest black spot, then upwards along the inner surface of the labium minus to just above the urethra, then across close to the roof of the urethra, which was defined by a catheter, then around the involved portion of the left labium minus. The very vascu-

lar tumor with the involved portions of the labia minora and the clitoris were removed, care being taken to cut wide of the growth. After tying numerous vessels the wound was sutured in the shape of an inverted Y. No enlargement of the inguinal glands was detected. Healing was by first intention.

The pathological examination of the specimen removed at the second operation, eleven months later, Aug. 31, 1900, is as follows: The specimen is a piece of tissue, 6.5 x 4 x 1 cm., consisting of skin from labia and subcutaneous tissue. It contains on the surface two nodules, one elevated 1 cm. with a base 2 x 3 cm.; the other elevated about 0.25 cm., with a base 0.5 cm. in diameter. Both are very darkly pigmented. There are in addition several areas of diffuse subcutaneous pigmentation, not indurated, and apparently non-inflammatory, and not elevated above the surface. The diagnosis then made was alveolar melanotic sarcoma.

Section through the *larger* nodule shows a growth surrounded by very dense fibrous tissue and divided by well marked bands of connective tissue into a number of large lobules; these are further divided by bands of connective tissue into smaller irregular areas. In most of these areas is a definite alveolar arrangement (Figure 2), but there is everywhere a small amount of stroma between the individual cells. The alveoli vary widely in size and shape, some being long and narrow, others large and irregular. In many places the alveolar arrangement becomes very indefinite only to assume a more typical character nearby. Occasionally long bands of spindle-shaped cells run through the section, breaking up this alveolar arrangement.

The cells in the alveolar part are oval or moderately elongated, except for an occasional band of typical spindle-shaped cells. These are in general fairly large and rarely a large one is seen with two or three nuclei. The cytoplasm is lightly stained and very finely granular. The nuclei are large, irregular, and slightly elongated; they are vesicular, have a definite nucleolar membrane and numerous fine chromatin granules. Many show a very definite nucleolus with fine radiating chromatin threads. Mitotic figures are numerous and beautifully preserved. There is no pigment in the alveolar portion. In this part of the tumor the blood vessels lie in the broad bands of stroma and have no intimate relation to the tumor cells.

In a part of the section the alveoli become irregularly elongated and separated by indefinite fan-shaped bands of connective tissue and then disappear altogether. In a large part of the tumor there is no alveolar arrangement except that running through the tumor

there are occasional bundles of narrow fibrous tissue bands enclosing long groups of cells. The whole nodule is surrounded by dense fibrous tissue. The cells in this part of the tumor differ only slightly from the others in the fact that they tend more towards a spindle-shape. Mitosis is less noticeable. Many of these cells are pigmented, chiefly those in and around the fan-shaped bands of connective tissue. Most of the pigment is, however, distributed in larger granules between the cells. This part of the tumor is not very vascular, and the few vessels noticeable in it do not seem to form an integral part.

This large nodule, as the gross description shows, spreads over the surface for 2-3 cm. The epithelium has disappeared, and the surface of the tumor shows some evidence of a chronic inflammatory process. In the adjacent tissue there is marked increase of connective tissue and infiltration of round cells and polymorphonuclear leucocytes. Although at its base the tumor is limited by a dense wall of fibrous tissue, its lateral borders are ill-defined. Along the edges the tissue is very vascular, and resembles granulation tissue.

The *smaller* nodule, about half a centimetre in diameter, lies just beneath the very thin layer of epidermis which remains. There is considerable stroma throughout the tissue and no tendency to alveolar arrangement. The tumor is not at all vascular. The cells are mostly elongated or typical spindle-shape; some are moderate-sized round cells. They have nearly the same character as the cells of the rest of the growth. Their nuclei, however, are more lightly stained and do not commonly show a nucleolus or numerous chromatin granules. A few cells show typical mitotic figures.

The only pigment in the main part of this nodule is in a few scattered tumor cells. At one side, where there is extensive invasion of the adjacent connective tissue there is an extraordinary amount of pigment. This is beneath a slightly hypertrophied epithelium, and the cross-sections of some of the papillae of the rete Malpighii are filled with pigment-bearing cells. From just beneath the epithelial layer these pigment cells fill the subjacent tissue down to the base of the tumor nodule. The pigment cells are mostly very much elongated cells, which lie together forming bands of stroma with the large tumor cells between them. In places there are many of the larger round tumor cells filled with pigment. The pigment is in rather large dark brown granules, which vary much in size and shape. There is little pigment between the cells. There is nowhere any hæmorrhage into the tissue, and no particular vascularity of the tumor or adjacent tissue, so the pigmentation does not seem to be from that source.

The patient returned to the hospital on Feb. 19, 1901, stating that three or four weeks after her discharge from the

hospital, which was on Sept. 17, 1900, she noticed a small swelling in the right groin, which gradually increased in size, and two months ago she had noticed a tumor in the left groin, which was also growing.

On examination a mass was found in the right groin lying beneath Poupart's ligament and projecting above and below it, which was fixed apparently to that ligament and to the aponeurosis, but not adherent to the skin. Owing to the shape of the tumor it was thought that it could best be removed by a curved incision with the convexity upward, the idea being that the blood supply would come from below through the superficial epigastric artery. On dissecting down to the aponeurosis, a very large mass, consisting apparently of all the inguinal and femoral glands, some of which were fused into a soft vascular, pigmented mass, was found, the thin capsule of which burst during removal, allowing the escape of a soft gelatinous material. The deepest part of the mass occupied the saphenous opening and was firmly adherent to, if it did not involve, the anterior wall of the saphenous vein at its entrance into the femoral. An opening was made in the anterior wall of the vein, which bled freely, but was caught in two hemostats and puckered up by a catgut ligature. After tying the blood vessels, with which the tumor was freely supplied, the aponeurosis of the external oblique and the fascia lata, which were widely exposed, was inspected and found to be clean, and apparently free from diseased tissue. Through an oblique incision the left inguinal glands, some of which were softened, melanotic, and enlarged to the size of an English walnut, were dissected out, and also two pigmented patches removed from the minor surface of the labia majora.

The patient left the hospital in about six weeks, the wounds having healed except for a sinus, and returned for treatment to the Out-Patient Department, where she continued until the sinus was healed.

The gross description of the tissue removed at the third operation (Feb. 23, 1901), seventeen months after the first operation, is as follows: A piece of skin 2 x 1.5 cm., which presents a very slightly elevated blue-black ramifying figure.

The pigmented area is sharply circumscribed in outline and of the same consistency as the rest of the skin. From the left groin, a mass of fat in which are imbedded three rather firm nodules, closely bound together. On section the nodules are deep bluish black in color and on pressure yield a thick inky fluid. One nodule, 1 cm. in diameter, is rather lighter in color, having a reddish tinge. The largest nodule, 2 x 2.8 cm., is softened at the centre. Detached from above mentioned masses is a nodule .5 cm. in diameter, similar to the larger ones. There is a black discoloration running away from the nodules through the fat tissues. The third specimen is from groin on the right side and consists of a mass of fat tissue and clotted blood. An oval tumor 5 x 3.5 x 4 cm.; for the most part fairly definitely encapsulated but in one or two places extending out into surrounding fat tissue. On section it shows greenish red and very soft. The cut surface is granular. The tissue pulls out like the tubules of an œdematous testicle. These threads are about 1 to 2 mm. in diameter, and often pull out 1 to 2 cm. in length.

An examination of the tissue after hardening in Zenker's fluid shows several irregular cysts with a firm capsule, lining which there is more or less soft tumor tissue and a fringe of very numerous smooth threads which with the hemorrhagic intercolumnar material filled these cavities like a bag of thread worms.

The sections of the tissue from the left groin show three different types of growth in the lymph nodes. In the smallest nodes where the metastatic tumor is of youngest duration we find a node of rich cellular lymphoid tissue. The follicles are large, and consist chiefly of plasma and lymphoid cells. Some of their cells are phagocytic and occasionally very large and vesicular. Between these is a rich lymphoid tissue with a moderate amount of stroma. Running in from the side between the follicles are bands of elongated cells with long lightly stained nuclei. These are not typical spindle cells, but look like rich proliferating connective tissue cells, and none of them are pigmented. In places they are scattered in the lymphoid tissue. Two rather doubtful mitotic figures were found. The tissue is not very vascular, and there is no sign of proliferation of the endothelium of the blood vessels. There are however, irregular spaces with no lining endothelium, which contain blood corpuscles and lymphoid cells and occasional large cells with a large irregular lightly stained nucleus. These cells have more or less brown pigment in fine granules. These cells, often with quite brown pigment, are also

found scattered about singly in the lymphoid tissue. Just outside of the lymph nodes some were seen in the lymph vessels. They are rarely seen in the blood vessels, and otherwise have no connection with them. Near one end of the lymph node many pigment cells occur singly and in small clumps. They have nearly round, lightly stained nuclei, and karyokinesis, if it exists, is hidden by the pigment. There is considerable rather œdematous stroma in the part where these tumor cells are most numerous.

About half a centimetre distant is another lymph node in which there is but little lymphoid tissue left. Nearly the whole of it is invaded by tumor cells with no definite arrangement inclosing here and there small islands of lymphoid cells. There are very few blood vessels, and they seem to have no relation to the tumor cells. There are between the cells many lymphocytes and connective tissue cells. The cells vary extremely in size and shape ; a few of them are elongated; they are all deeply pigmented with rich brown pigment in large granules. The nuclei which are mostly hidden by the pigment are medium-sized, round, and lightly stained. Mitotic figures are not seen. There are numerous almost perfectly round empty spaces in the masses of tumor cells. The smallest of these seem to be formed by several of the pigmented cells each offering a flat or concave side to help in forming the well-defined border. Some of the larger and better formed spaces seem to have a very delicate lining membrane and one or two of the connective tissue cells of the stroma seem to have a part in their formation. None of them appear to have any wall of endothelial cells and they are all empty.

Near by is a larger lymph node completely invaded by the tumor. About the periphery the tissue consists mostly of large rounded tumor cells of the epithelioid type with large vesicular nuclei. Few of them show mitotic figures and rarely are they pigmented. There is some stroma to be seen between all the cells, but it is mostly arranged in narrow poorly defined bands which to a certain extent divide the tumor into alveoli. Near the centre this alveolar arrangement is well marked, and there is almost no intercellular tissue in the groups of tumor cells, and the bands of stroma are broader. Here it is noticeable that the tumor cells show very many more mitotic figures, and that none of them are pigmented. There is no evidence of a central vessel in these alveoli.

In the centre of the node there is a rich connective tissue of elongated cells radiating in broad bands to the periphery. Enclosed in this stroma are deeply pigmented cells of all sizes and shapes, many quite long and some very large. Throughout this tissue there are still many lymphoid cells. The blood vessels which are not very numerous are surrounded by a slight œdematous tissue, and the whole stroma is rather œdematous. There are occasional spaces surrounded by pigmented cells like those in the nodule just described.

At one side these pigmented cells extend out into the more alveolar part of the growth, and are scattered among the non-pigmented cells of the growth. They seem to differ from these only in their large size and varied form and the occasional multiplicity of their nuclei, and the fact that they do not seem to show mitotic figures. Often a large pigmented cell has become phagocytic and included a smaller cell and rarely one of the non-pigmented tumor cells is phagocytic.

In two or three instances one of these large pigmented cells surrounded an empty vacuole. These suggest the vaso-formative cells of the sarcoma angioplastique as described by Malassez and Carnot.

The medium sized nodule removed shows a growth which at first glance appears to be of an entirely different type. Except at one point there is no lymphoid tissue. The tumor growth is definitely separated from this by a capsule of loose fibrous tissue, in the meshes of which there are great numbers of pigmented cells, forming a tissue resembling the centre of the nodule just described. The new growth consists of masses of cells showing no definite arrangement. There are slits and irregular spaces everywhere, mostly empty, but rarely containing blood corpuscles. There is a little stroma between the individual cells. Running in every direction are narrow bands of connective tissue which divide the tumor into poorly defined lobules. In these bands there are often blood and lymph vessels. The cells seem to cluster more or less closely about the borders of these lobules, and in the centre there is rarely a small blood vessel or an irregular space partly filled with blood. The cells are spindle-shaped and multiform ; they are mostly large and have a single or rarely two or three very large, vesicular nuclei with a well-defined nucleolus. Many show mitotic figures. A great part of the cells are very lightly pigmented with fine granules. At the borders of the lobules and in the bands separating them are a great number of large cells deeply pigmented with coarse brown granules. Phagocytosis is quite common, especially among the pigmented cells. Sometimes a large pigmented cell is seen inclosing a smaller cell of the same type.

There is adjacent an evidently similar nodule which has been filled with haemorrhage. In this can be recognized the outlines of vessels and necrotic tissue and a great deal of brown pigment and pigment cells. With the connective tissue stain the blood vessels are very clearly shown running everywhere through the nodule and closely surrounded by partly necrotic masses of tumor cells.

The larger nodule from this groin shows the tubular type of growth. (Figure 3.) The capsule of loose connective tissue has many large irregular spaces filled with blood corpuscles. The tumor is everywhere threaded with a network of blood vessels, mostly filled with blood corpuscles. These have a definite endothelium,

and surrounding this in the larger vessels are one or more layers of long narrow adventitia cells. The tumor cells are closely arranged about these vessels forming a mantel of many compact layers. In a few places along the side of the tumor nodule the cells form a loose structure somewhat more compact close to the blood vessels, and midway between these vessels there are numerous irregular splits in the tissue. A little further from the wall these splits are larger, and most often filled with blood corpuscles and fibrin, while the tumor cells clustering about the blood vessels form more definite cylinders. Nearer the centre there is between these cell cylinders more fibrin and necrosis of the intertubular cells, and in places definite fibres of connective tissue partly enclose the masses of cells about the blood vessels. In the very centre the tubular character is much more marked. The blood vessel is generally larger and the connective tissue stain shows delicate fibres of connective tissue running out between the tumor cells around the blood vessels, in some even to the connective tissue layer which wholly surrounds the cell mantel. Thus the greater part of the tumor is made up of definite blood vessels surrounded by eight to twenty layers of cells ; the whole being enclosed by a complete layer of connective tissue fibres, forming an almost round tube. Between these tubes there are blood c rpuscles, fibrin, and some loose tumor cells.

The cells of this nodule have the same general character of those already described. They are all nearer a medium size and vary less in shape. The most of them are round, and the few elongated ones have their long axis perpendicular to the vessel wall. The nuclei are large and round, and show very many typical mitotic figures. Many of them are phagocytic. None of them are pigmented. There is no evidence of any intravascular proliferation of the endothelium, and the endothelial cells all appear to be normal, and there are no transitional forms between them and the tumor cells.

The tissue removed from right groin consists chiefly of one large nodule and some smaller nodules. These are definitely encapsulated, and do not seem to be invading adjacent tissues. The largest nodule has very nearly the same microscopical characteristics as the last nodule described in the other groin. Lining the loose connective tissue capsule is a quite compact tissue of tumor cells with a definite stroma, separated here and there by small blood vessels running out from the side. A short distance from the wall and in places even beginning at the wall are slits in the tissue midway between these vessels. Sometimes the division is not complete, several of these perivascular cell masses being close together in one mass. In other places the slits are filled with blood, fibrin, and loose tumor cells, but there is little of this near the border. There is also correspondingly less connective tissue to form the outer border of these cell tubes, although the intercellular fibrillæ of con-

nective tissue extending out from the vascular wall are well developed. In the very centre of the nodule the tubules have almost all a smooth outer wall of connective tissue.

One of the smallest nodules shows the tubular type of growth very beautifully. There is considerable hæmorrhage between the tubules, and though at the side this has split the tissue up very irregularly, in the centre there are very definite perivascular cell cylinders surrounded in places by several layers of connective tissue. In the intertubular spaces there is much hæmorrhage and fibrin and delicate strands of connective tissue. These perivascular tubules, either partially or completely enclosed with connective tissue, are well shown in Figure 3.

An encapsulated nodule a little over one centimetre in diameter shows near the border a growth of much the same type as that of the medium-sized nodule of the other side. A loose tissue of multiform cells traversed by blood vessels and broken up by intervascular slits. There is little hæmorrhage except in the very middle of the nodule where it fills the slightly larger intervascular slits. The nodule appears to be a very vascular sarcoma broken up by hæmorrhage into the tissue. In the middle there are a few connective tissue fibrillæ forming around the cell cylinders. Only one or two of these are completely surrounded, and the tubular character is only poorly shown. A small bit of lymphoid tissue near this is infiltrated with large spindle-cells running in bands in every direction. They have large vesicular nuclei which rarely show mitotic figures.

On May 15, 1901, the patient was readmitted to the hospital. Her husband stated that five days before entrance she began to complain of headache, became slack in her work and careless about her dress. Three days before she seemed dazed and did not feel able to get up. She appeared indifferent to the exposure of her person, and two days before entrance became delirious at night. The next morning her husband noticed that she had difficulty in using her left arm and walked with a limp as if her left leg were affected. She seemed drowsy and continued to complain of headache. He stated that she had twitching of the left arm and hand two days before. She vomited the day before entrance and on the day of entrance. On examination she was found to be stupid and drowsy, but replied to questions. The pupils were equal, but the right was larger than the left. The left pupil reacted sluggishly to light. The tongue was protruded in the median line. There was no facial paralysis. She

moved her right extremities rather than the left. The abdomen showed some induration about the scar of the old operation in the right groin. There was no evidence of recurrence of the tumor about the vulva. The left knee jerk was more marked than the right. Babinski present on left. No clonus. No loss of sensation. On Sept. 16th she was in coma. The left pupil was larger than the right. Both reacted equally. There was slight irregular twitching lasting half a minute, affecting the right hand and wrist and extending to the right leg. The pulse was increasing in rapidity.

Diagnosis of cerebral tumor involving the motor area of right side was made, and Dr. John C. Munro operated, trephining over the middle centre of the motor area of the right side. The dura was under high tension, and did not pulsate. On opening the dura there was very marked bulging of the brain. The pia was slightly opaque over the convolutions. There was no difference in the elasticity of the brain or in the feel. A director was passed towards the ventricle, no fluid escaping. As it was thought that the tumor might lie on the opposite side, a small trephine opening was made on the left and the ventricle tapped. Considerable serum escaped until the tension and pressure on the left became normal. The bulging brain on the right side did not recede on relief of pressure on left. A wedge-shaped piece was cut out of the convolution in approximately the region of the arm centre, and close beneath the cortex was found a soft black sarcomatous-like tissue, fairly differentiated from the surrounding brain and extending upward toward the leg centre. This growth was curetted out, leaving a cavity about the size of an English walnut, allowing the surface to reach the normal level. The wound on the left was closed with a capillary drain; that on the right was closed without replacing the dura. The patient required moderate stimulation, but was in fair condition at the close of the operation. She never recovered consciousness, however, and died two days after the operation.

The following is an extract from the autopsy protocol in this case:

Body that of a well developed, obese woman. In right groin a scar 4 cm. long, parallel to Poupart's ligament. In left thigh in region of Scarpa's triangle a shorter vertical scar. Over abdomen between umbilicus and symphysis is a superficial cicatrix about 6 x 3 cm. Over shins several small superficial cicatrices; in mid-line of neck scar of old tracheotomy wound. On vulva in region of mons a pigmented mole .5 cm. in diameter.

Peritoneal cavity normal. Omentum and mesentery contain very large amount of fat. In central part of transverse meso-colon, very close to colon wall, is a small dark colored nodule .5 cm. in diameter. In mesentery near attachment to ileum are two black nodules. One is situated 28 cm. from ileo-coecal valve and is 1 cm. in diameter and smooth in contour. The other, 150 cm. from valve, is 2 cm. in diameter and nodular. Both are quite firm on pressure. No other nodules in mesentery. In right groin just internal to crural arch is a mass of three glands. The mass measures 7 x 3 x 2.5 cm. When the capsule of the gland is cut much fluid blood and stringy material wells out. This is soft, dark red, and tears in long threads which examined under the microscope are seen to be blood vessels surrounded by several layers of cells. External to crural arch and along femoral vessels there are no involved glands on either side. Along the internal iliac is a similar gland about 2 cm. long, 0.5 to 0.75 cm. in diameter. Above this near common iliac is a smaller one, and in the retroperitoneal tissue below the right kidney and a little to the right of the inferior vena cava is a gland about the size of a pigeon's egg. All are of the same dark red color. No other masses are to be made out.

Pleural cavity: Both lungs slightly adherent posteriorly to parietes by fibrous adhesions.

Pericardial cavity normal.

Heart weight 400 gms.

Measurements. Tricuspid valve 12 cm.
Pulmonary valve 7.5 cm.
Mitral valve 8 cm.
Aortic valve 7.5 cm.
Wall of left ventricle 1.4 cm. thick.
Wall of right ventricle 0.5 cm. thick.

The epicardium and myocardium normal. Pulmonary valves normal. Two of the tricuspid flaps adjacent to intraventricular septum are interadherent for .5 cm. at a point 1 cm. from their insertion and adjacent chordae tendineæ are slightly thickened and shortened. The valve itself is slightly thickened. The mitral valve and its chordae tendineæ are shortened and thickened. At the intraventricular insertion of the flaps they are interadherent for about 1.5 cm., and here is situated a rough calcareous nodule about 1 cm. thick. In edge of mitral valves are other small calcified nodules.

By these changes both stenosis and insufficiency of the valve is produced, though not to a marked extent. The aortic cusps are much thickened, irregular and in part calcified so that there is considerable imperfection of this valve also. Coronary arteries show a very few small yellow areas of thickening. Frozen section shows no fat droplets in myocardium.

Lungs. Over the surface of both lungs are a number of black areas .5–1 cm. in diameter of irregular contour and on section extending 2–5 mm. into lung. These are firm. On surface of right upper lobe are about 8 ; on right middle, 6 ; on right lower, 10 ; on left upper, 20 ; and on left lower, 10. They seem limited to surface, none being found in depth. On section lungs are red, moist and everywhere air-containing. The bronchi are injected, and from some of the smaller ones slight amount of muco-pus exudes. Bronchial lymph nodes are black resembling nodules above described but not larger.

Spleen. Weight 130 grammes. Surface smooth. On section reddish gray. Malpighian bodies indistinct. Pulp not increased. Consistence normal. No nodules.

Gastro-intestinal tract normal.

Pancreas rather small, reddish, normal.

Liver. Weight 1,220 grammes. Surface smooth. On section brownish red, mottled with irregular areas of reddish yellow. Lobules indistinct. No nodules. Gall bladder and ducts normal.

Kidneys. Weight 290 grammes. Surface smooth. Capsule strips with little difficulty, tearing away small bits of tissue. On section grayish red. Glomeruli just visible. Markings of pyramids distinct. Frozen sections show many tubules in whose epithelium are numerous fat droplets.

Adrenals and bladder normal.

Uterus contains a dozen or more fibro-myomata from 1–6 cm. in diameter, the whole making a nodular mass 13 x 8 x 6 cm. On section these are grayish white, elastic, and easily peel out. In the centre of one is a soft brownish red area, 1 cm. in diameter. Uterine mucosa normal. Vagina normal. In right broad ligament is a small cyst containing clear, reddish fluid. Tubes and ovaries normal.

Aorta shows a few small areas of thickening, no calcification.

Organs of neck normal.

Brain. Weight 1,255 grammes. The shaven scalp shows two recent operation wounds, one a flap incision 10 cm. long curving inwards and backwards over the posterior temporal and parietal regions to a point somewhat posterior to a place midway between glabella and occipital protuberance and enclosing an oval area of infiltrated skin with attachment below; the other, over left parietal boss, an oblique incision 3 cm. long in a plane in which lie the

lobule of ear and a point midway between right mastoid and the occipital protuberance. Around the second incision there is no inflammatory reaction. The scalp is somewhat œdematous. The calvarium shows trephine-holes corresponding with external wounds, one 5 cm. in diameter with innermost point 6 cm. from median sagittal plane and most anterior point 2 cm. behind coronal suture, the other 1.5 cm. in diameter, 5 cm. external to the median sagittal plane and 5 cm. posterior to the coronal suture.

Through the larger trephine there pouts a soft ragged, dark red, oozy mass, which hardly looks like brain tissue. There is no projecting mass from the other hole which is thick and without diploe, the dura is exposed, normal in appearance, except in regions of operation and in prefrontal region where a dark mass shows through, suggesting clot. The longitudinal sinus is empty.

Removal of dura exposes a somewhat injected pia with interruptions at foci of operation. When the brain is put upon a board the right hemisphere bulges anteriorly and laterally at least 1 cm. beyond the corresponding extent of the left hemisphere. The right prefrontal area shows flattened convolutions with fluctuant area having a firm centre, bluish black. A distance of 2 cm. inward and forward of foremost point of large trephine-hole, there is a dark blue-black area 3 cm. in diameter; 6 cm. from anterior pole of left hemisphere and 4 cm. from great fissure is another subpial nodule of similar aspect, .5 cm. in diameter. Left occipital lobe shows nodule 1 cm. in diameter, 2 cm. from the posterior pole. On the posterior-superior lobe of the right cerebellar hemisphere is a nodule 1.5 cm. in diameter.

The middle portion of the right optic thalamus shows a nodule 2 x 2 x 1 cm., with major axis anteroposterior. These nodules on section resemble each other in having a firm, gray, red centre, granular and somewhat thready, surrounded by a jelly-like, dark red zone, with smooth section surface, fading rather suddenly out into normal brain tissue. Around the prefrontal nodule the centrum semiovale is brownish yellow and slightly firmer than normal white matter. The area thus changed in color is colored so throughout, but overlying cortex seems unaltered.

The brain, outside nodules and discolored area seems normal.

Anatomical Diagnosis.

Perivascular angio-sarcoma of deep inguinal and retroperitoneal lymph nodes.

Sarcomatous metastases in mesenteric lymph nodes.

Multiple sarcomatous metastases of brain.

Multiple pigmented nodules in lungs.

Chronic fibrous pleuritis (both sides).

Chronic endocarditis (tricuspid, mitral and aortic).

Mitral stenosis.
Mitral and aortic insufficiency.
Slight acute bronchitis.
Multiple fibro-myomata of uterus.
Sarcomatous metastasis in fibro-myoma of uterus.
Cyst of broad ligament.

The sections of the main tumor removed at autopsy show that these long cell cylinders, curiously interwoven, fill the entire cystic space. The intertubular blood and fibrin has washed out in the first hardening process. These cylinders or tubules have definite outer wall of connective tissue. Some of them are a millimeter or more in diameter, and have a thick layer of connective tissue between the endothelium and the tumor cells and an outer covering of several layers of connective tissue. Lining the capsule there is a very little sarcomatous tissue of a very vascular type that is irregularly divided by narrow spaces.

One of the deep inguinal lymph nodes shows an extremely vascular growth. See Figure 4. The vessels are numerous and each one is surrounded by a mantel of tumor cells which in some parts is very scanty. The vessels appear to be so numerous that there are hardly enough tumor cells to go around. All these tubules have an outer coat of connective tissue and fibrin, which is rather thick and encloses some leucocytes and small round cells in its meshes. See Figure 5. There is considerable hæmorrhage between the tubules and in places there is thrombosis of the vessels and necrosis of all the tissue.

An external iliac lymph node shows a quite vascular growth surrounded by a dense capsule. There is considerable hæmorrhage, which breaks up the tumor tissue very irregularly except in one part, where the tubules are very evenly divided by masses of blood corpuscles. Figure 6. The cells of this nodule seem to bear a much more intimate relation to the blood vessel wall than those in the young metastases previously described. The endothelium of the vessels is everywhere normal.

Separated from the adjacent tumor growth by a thick fibrous wall is a large vessel lying in a space partly filled by hæmorrhage. This vessel is surrounded like the tubules of the main tumor by a thick wall of tumor cells and an outer coat of fibrin and connective tissue.

Nodules from near the left inferior vena cava, and the large and small nodules on the ileum and colon show a very similar growth. Figures 7 and 8. There is a definite capsule surrounding a loose vascular tissue of the same structure throughout. Most of the cells are very closely arranged about the blood vessels. There is more or less hæmorrhage and loose tumor cells in the intervascular tissue, and in places there are leucocytes and round cells and necrosis. The tumor cells vary extremely in size, but are mostly round. The nuclei stain darkly and show a moderate number of mitoses. There are

very many multinuclear giant cells and phagocytic cells. There are but few cells about each vessel, but these seem to be very intimately associated with the adventitia. The endothelium of the blood vessel does not show any alteration.

A section of the soft brown spot described in one of the fibro-myomas of the uterus shows a growth which suggests the alveolar type where it is invading the adjacent tissue, but nearer the centre is quite vascular and split up by much hæmorrhage, while the cells show a slight tendency to perivascular arrangement. The cells are mostly large, irregular in shape, and contain one or several darkly stained nuclei. The typical tissue of the surrounding fibro-myoma shows large areas of hyaline degeneration.

The metastases in the brain show a growth which is very vascular and somewhat œdematous. There are more polymorphonuclear leucocytes and round cells and necrosis in the intervascular tissue, and in places the perivascular growth is well marked. The nodules are small and there is no distinct tubular character. There are few giant cells and not many mitoses. The cells are not quite as much a part of the adventitia of the vessel wall as in the nodule on the intestine. The blood vessels of these nodules are occasionally dilated, giving a teleangiectatic appearance.

The spleen is practically normal exept for numerous minute areas of fresh hæmorrhage in the tissue.

The section of the lung shows a nearly normal tissue with occasional small areas where the capillaries are filled with blood and the alveoli nearly full of polymorphonuclear leucocytes, lymphocytes, and endothelial cells. There are a few phagocytic cells and almost no fibrin. A section through one of the pigmented areas in the pleura shows a small area very definitely walled off by a thick fibrous wall. This area is extremely vascular, and there is considerable connective tissue throughout it. Along the border are small groups of lymphoid cells, but it is mostly made up of large irregular pigmented cells. In the connective tissue about this nodule the pigment cells are long and spindle-shaped with a long oval nucleus ; in the centre they are larger, quite irregular, and have very darkly stained nearly round nuclei. They appear more like altered endothelial cells. The pigment is in large and small black granules, and does not generally fill the cell. It appears more like the anthracotic pigment often found in the lung. Some of these cells are phagocytic. These cells have no definite arrangement, but are scattered about through this nodule. There are no mitotic figures. In sections of these lung nodules preserved in alcohol and stained for pigment, the pigment granules appear perfectly black.

The liver shows moderate congestion and slight fatty degeneration of some of the cells.

The kidney is slightly congested, and there are a few hyaline casts

in some of the descending tubules. The epithelium of the convoluted tubules is swollen, and in places fills the whole space and shows no nuclei ; it is also ragged and occasionally stripped off.

Section from the so-called pigmented mole found on the vulva shows a chronic inflammatory process with no pigmentation. There are numerous round cells and several giant cells, one of which encloses a bit of suture.

CASE II.

This second case is added from the pathological records because it is of the same type as the other, and has taken a similar course.

C. M., a man 68 years old, was seen in the Surgical Out Patient Department April 30, 1896. He said that a short time before he first noticed a warty growth on the glans penis. "Some one told him to tie a horse hair lightly around it and it would go away." The top of the wart was gone, but the glans was inflamed. For one or two years he has been rising at night to micturate.

Microscopic examination. A small portion of the nodule on section shows a tumor situated superficially ; the epidermis over it is not ulcerated. In a large part of the tumor there is hæmorrhage. The tumor is composed of several masses. Between them there is rather loose tissue with a great deal of hæmorrhage in places, with numerous blood vessels and spindle-shaped cells. In some of the tumor masses there are also large vascular spaces. With high power the tumor is composed of large, irregular and spindle-shaped cells. In the looser parts there is considerable hæmorrhage. There are numerous blood vessels with very indefinite walls.

He was admitted to the hospital June 29, 1896, but operation was not then advised.

November 2, 1896, he was again admitted to the hospital. Since last June he has been passing bloody urine all the time, and has had one good hæmorrhage of "nearly a pint." Physical examination showed a rather emaciated old man. The growth in the penis has not increased much in size. There could be felt, however, a distinct line of thick induration running up the dorsum of the penis. The inguinal lymph nodes on the right side were somewhat enlarged and very hard. A portion of the penis was amputated by Dr. J. C. Munro.

The gross examination was as follows:

On slitting up the glans there is a tumor mass which projects within the urethra. This mass is 3.5 cm. long by 1.5 cm. thick. The mass is attached to the lower surface of the urethra over an area 1.5 cm. long by 0.5 cm. broad. The mass when hardened is of a grayish color; when fresh it was comparatively firm. The cut surface is almost homogeneous, but shows a very few irregular fissures. The anterior extremity projects to the meatus. The very tip projects through, and is necrotic. The general shape is that of a pecan nut. The surface is smooth. The urethra is dilated posterior to the growth. No induration of the tissue in this vicinity.

Microscopical. Sections were made directly through the growth and stained with eosin and hæmatoxylin.

The mucous membrane of the urethra immediately adjoining the growth is somewhat thickened and infiltrated with round and epithelioid cells. At the origin of the tumor from the urethra it comes in contact with this submucous epithelioid infiltration. The tumor cells are immediately in contact with this, but they do not appear to pass into it, though the epithelioid infiltration at this point so closely resembles some of the cells of the tumor that it is difficult to say they are not the same. Over the surface of the tumor, for almost its entire extent, there is a very thin epithelial covering. In places this is perfectly definite; in places only traces of it can be seen, and in still other places it is entirely absent. There is some hæmorrhage and necrosis on the surface of the tumor. The tumor is a *sarcoma*. In its deeper portions there are large masses of cells, spindle and multiform without any very definite arrangement, and containing numbers of clear nuclear figures. The large masses of cells are separated from one another to some extent by fissures, and there are smaller fissures proceeding off from these. There are also numerous small openings and splits in the tumor, apparently not connected with the larger fissures. These smaller splits apparently correspond to blood vessels and contain blood corpuscles. In other parts of the tumor this appearance is better marked. There is a general division of the tumor here into lobules, and in the centre of the lobules a blood vessel is found. In still other parts of the tumor there is an arrangement somewhat suggesting an epithelial growth, the cells along the sides of the vessels being arranged more or less in single masses and growing with much irregularity. Among the cells there are many very large ones with several nuclei. In its general arrangement it has a certain amount of similarity to the angio-sarcoma, and it probably develops from the adventitia of the blood-vessels. The spaces which are found in the tumor may be considered as lymphatic spaces. There is a small portion of the gland

in which the epithelium is somewhat thickened and in the subepithelial tissue there is the same intense infiltration with epithelioid cells, which very closely resembles tumor cells, and in places this growth appears to be breaking into the lower limits of the epithelium.

He was readmitted to the hospital Nov. 25, 1898. Several months before this he began to notice a swelling in the right groin; gradually increasing in size, it was now about the size of a hen's egg. Two months ago the growth began to recur in the stump of the penis.

In the right groin a tumor about 8 cm. in diameter could be felt. It was freely movable. On the indurated stump of the penis were several nodular growths from beneath the foreskin. The inguinal lymph nodes and part of the penis were removed.

The specimen is in two parts. One is the amputated portion of penis, about 4.5 cm. long and 4 cm. thick, covered with skin. At distal end is a raised, cauliflower growth white to purplish black in color, about 1.75 cm. by 1 cm. and of firm consistency. At base of growth are two old cicatrices. The other part of the specimen is an egg-shaped mottled mass 4 cm. long by 3 cm. thick, of firm consistency. On section the mass appears mottled, gray and reddish brown. The surface is covered with a thin blood stained fluid.

Sections from the recurrence at the original site show a growth of the sarcoma type which is everywhere invading the surrounding tissue. Near the border and scattered through the tumor there are fairly well defined alveoli each containing a few tumor cells and separated from one another by a fair amount of stroma. The alveolar arrangement is lost in the greater part of the growth, and the tissue is broken up by very irregular spaces and the tumor cells grouped about the blood vessels. There are many which have a very scanty endothelial wall, and there are some round spaces containing blood corpuscles which have a fairly definite border apparently formed by the stroma and tumor cells without any definite endothelial lining. The tumor cells vary much in size and shape, but are mostly fairly large rounded cells. They have large round nuclei in which there are many chromatin granules and fairly numerous mitoses. There are some multinucleated cells. None of these cells are pigmented, although there is some light brown pigmentation of some of the cells in the stroma and surrounding tissue.

The tumor from the groin is mostly enclosed by a fibrous capsule which in places is much infiltrated with lymphocytes. The cells

vary much in type. Most are fairly large round cells with a large nucleus, generally rich in chromatin granules. Many of the nuclei stain very darkly and show various stages of karyokinesis. There are a great number of large giant cells with five or six nuclei; some of these are phagocytic. There are a few places in the border in which a little lymphoid tissue remains. The tumor cells are invading this tissue through the lymph spaces and vessels and in places there are round masses and long columns of them. There is considerable congestion and hæmorrhage into this lymphoid tissue. The most of the tumor is a pretty solid growth traversed here and there by definite bands of connective tissue and blood vessels. There is considerable stroma between the cells and some lymphocytes in it. In parts of the tumor the cells are very closely arranged in several layers around the blood vessels, and midway between the vessels the tissue is split and in this space there is sometimes blood, fibrin, necrotic material, and occasional lymphocytes. The tissue shows a very typical perivascular tubular arrangement.

The sarcoma according to Virchow in 1860 was considered to be a connective tissue tumor in which the cellular elements predominate. The latest definition, that of Ribbert, 1901, differs very little from the earlier ideas. He says it is a connective tissue tumor with *extensive* development of the rich protoplasmic cells. Paget, Lancereaux, and Cornil and Ranvier classed the sarcomatous tumors as forms of fibroma.

In 1858 Billroth gave to an interesting type of sarcoma the name cylindroma. This name through common usage has been retained up to the present time, although such a name has no place in the true classification of tumors. We find that a cylindroma was defined as "a tumor with cylinders and rounded structures having a hyaline character and mucous-like tissue. In their centre is often a blood vessel with hyaline mantle, and between these are masses of tumor cells. The cylinders arise from hyaline or mucous degeneration of the vessel walls."

The later work of Billroth used the terms alveolar and plexiform sarcoma for these characteristic tumors which Waldeyer from their histogenesis called angiosarcomata. He recognized their origin from the blood vessel walls. Virchow in his book has cited two cases of alveolar and two of plexiform sarcoma. He expressed much doubt as to the origin of these tumors, and was disposed to believe that they

were of a mixed sarcomatous and carcinomatous type. Rindfleisch in 1873, thought the alveolar sarcoma to be a carcinomatous degeneration of sarcoma, and called it a sarcoma carcinomatodes. To designate the tumors of this group other names have been used as the Siphonoma of Henle and Brush, Schlauchgeschwülste, Schleimcancroid, lymphangio-carcinosarcoma intravascular and some still more varied.

There has always been much discussion as to the type of this tumor. Even now in the latest books of v. Hansemann and Ribbert, there is much doubt expressed as to the place of the alveolar sarcoma, and the question is raised whether it should not be struck out of the group of sarcoma.

The name endothelioma was first applied by Golgi in 1869 to designate a tumor arising from the cells of the smallest capillaries. In 1874 Sattler explained that this type of tumor was the product of pathological hyperplasia of the endothelium, and that the hyaline degeneration from which the term cylindroma arose is not a necessary characteristic of endothelial tumors.

Kolaczek four years later collected from the literature the tumors of this kind which had hitherto been described under various names. He agreed with others in the fact that they arose from the endothelial proliferation of the blood vessel walls and only rarely have the lymph vessels any part in their origin. In his second article on angiosarcoma, indeed, he has to use some artificiality to include some of the eight cases he reports under this category. Many writers believe that Kolaczek has misplaced the matrix from which these tumors arise. Ackermann and Neumann assert that they rarely arose thus from the intima, but more commonly from the endothelium of the intervascular lymph spaces. Von Hippel and Barth distinguish as of equal importance both the groups of hemangio- and lymphangiosarcoma.

Eberth in 1870, was the originator of the term perithelium to apply to "the highly developed flat layer of endothelial cells" which forms an outer covering for the blood vessels of the brain and spinal cord. Among others who have studied the perithelium, Kolaczek recognized in a great

number of capillaries special adventitia cells, and Sortoli, v. Luschka, v. Brunn and others have described a so-called perithelium in the pia-mater, testicle, and coccygeal, carotid, pineal, breast, and parotid glands. Waldeyer has described the perithelium in the vessels of the testicle as "a thick, rich layer of cells not always sharply marked off from the surrounding tissue, and appearing more often to run into the spindle-shaped bodies of the connective tissue." But the word from its derivation must mean a lining membrane, and it seems to be best defined by Driessen, Perthes, Hildebrand, and Best who conceive it to be the lining endothelium of the perivascular lymph spaces.

Such is the earlier history of the controversy as to the origin of this group of tumors. Virchow says not the histological picture of a tumor, or the type of its cells but the manner of its origin and the tissue from which it springs must decide the classification of tumors.

Ackermann states that all sarcomata have blood vessels as their mother tissue. This is, however, probably far from correct. At least the vessels of sarcoma are much more numerous than those of any other connective tissue tumor. The angiosarcoma is an angioma with sarcomatous proliferation of the vessel walls. Lucken believes that the development of vessels is primary and chief, and the sarcomatous proliferation of blood vessel cells is secondary and calls it an angioma sarcomatosum. Thoma calls them cellular varieties of hemangioma and distinguishes two forms, telangiectatic sarcoma and perithelial sarcoma, and both may be combined in the same tumor.

According to most writers these tumors may arise from either the endothelium of the blood vessel or that of the perivascular lymph space, that is the perithelium. Many cases of simple endothelioma have been described. Tumors of the perithelial type have been reported by Putiata, Waldeyer, Jaffes v. Hippel, Barth, Manasse, and others. And some of the cases of Driessen, Hildebrand, Paltauf, Paoli, Perthes v. Rostkorn, and Best show tumors arising at the same time from both the endothelium and perithelium.

Volkmann makes no principal distinction between the perivascular sarcoma and the endothelioma, but describes the adventitial proliferation as a "secondary and quantitatively insignificant process" in the tumor from the endothelium. In the great material at his disposal he has only once seen a growth exclusively out of the capillary wall proliferations, but finds it combined with lymph-endothelium proliferation. Malherbe in his recent study of sarcoma, considers the angiosarcoma as of endothelial origin alone.

It will be seen that many varieties of this type of tumor have been described, but there has been no satisfactory attempt to classify them. Manasse in a recent article seems to offer the best arrangement. Besides the two forms of blood and lymph vessel endothelioma, he includes with the angiosarcoma a third variety, the perivascular sarcoma. He says it arises from proliferation of the adventitia cells. He describes it as a very spongy mass of vessels, both parallel and crossing one another, and each surrounded by one or more layers of polyhedral, cuboidal, cylindrical, or elongated cells. The greater part of the tumor consists of vessels with only a thin normal endothelium, and a thick perivascular mantle of spindle-shaped epithelioid cells containing many mitotic figures. Most of the cases of Waldeyer, Putiata, and Kolaczek and a few of the kidney tumors of Paoli and the three cases of Maurer come under this description. Manasse says this type of tumor is from the adventitia cells, whether they are called perithelium or not, and is not a lymph-vessel endothelioma.

Borrmann has recently still further divided the angioma. After mentioning the simple angiomata, hemangioma and lymphangioma, he considers the others as endotheliomata from the blood vessels, the lymph vessels or the capillaries, and adds two other varieties of unknown origin. The perithelioma consists principally of vessels around the outer wall, of which are several layers of cells, with their long axis perpendicular to the vessel wall, and the periendothelioma is similar except that the cells have their long axis parallel to the direction of the vessels. The cells in the perithelioma are like those of the spindle-cell sarcoma, are arranged radi-

ating from the vessels, are the only structure between the vessels, and in no way related to the endothelium. In peri-endothelioma, a case of which has just been reported by Wells, the cells are parallel to the wall in marked contra distinction to the perithelioma, but this type does not seem to be well differentiated from the lymph vessel endotheliomata which are not uncommon especially in the brain. This perithelioma is evidently the same as the perivascular sarcoma of Manasse. Now the term perithelioma, as Borrmann here uses it, is not well chosen, for most all agree that the perithelium is the endothelial lining of the perivascular lymph space, and he calls the tumors arising from those cells the lympho-angio-endothelioma.

It is simpler to adopt the terminology of Manasse, which includes all the forms that Borrmann names, and is at least as far as it goes satisfactory. Thus we have the hemangio and lymphangio-endotheliomata and the perivascular sarcoma. It is to the third group that the two cases here reported belong.

The reasons for classing these tumors as perivascular angiosarcoma will be best shown in a review of the principal points in their development. In the first case the original growth was a melano-sarcoma developing in a mole. Formerly the pigmented mole was thought to be derived from any place in the connective tissue and distinguished only by its pigment. V. Recklinghausen was the first to assert that pigmented nævi and the melanosarcomata arising from them originate from the endothelium of the lymph spaces. Unna thought they originated from bits of epithelial tissue which have previously been included and surrounded by connective tissue. The latest and most generally accepted view is Ribbert's modification of the older idea, in which he claims that they develop from special pigment-producing connective tissue cells. However, we may explain the origin of this tumor, its histology and subsequent development is surely that of a connective tissue growth. The spindle-shaped cells, the mitoses and the growing border of this first nodule are all suggestive of a malignant tumor.

The pigmentation of this tumor is of the true melanotic type. The granules are mostly within the cells and in the

newer cells are much lighter and smaller. The pigment cells show the chief types described by Ribbert in his work on melanosarcoma. In the primary growth and in the small nodule of the recurrence we find the pigment mostly in the surrounding connective tissue and especially thick in those cells lying in the adjacent skin. Possibly this is suggestive of its origin in the normal pigment-producing cells. It is noticeable that the pigment in the recurrence is also most marked in the stroma and in that part of the tumor which has more the character of a spindle-cell sarcoma. In the metastases in the groin we find in the earliest nodules that the invasion consists almost wholly of pigment cells. This agrees well with the view that the pigmented sarcoma is the most malignant type. In all the *pigmented* metastatic growths, the invasion was by means of the lymph channels. In those metastases which were dependent on the blood current for their origin we find no pigment cells, and the light brown color is entirely due to intercellular hæmorrhage. This however, may be explained by the fact that all the true pigmented nodules developed by direct metastasis from the pigmented tumor of the skin, while the others were only indirectly from them. We know that in the generalization of a melanosarcoma of the skin the metastatic nodules are nearly always pigmented and generally more deeply than the original growth. It may be that the cells carried from the secondary nodules to the tertiary group of metastases were not pigment-producing cells.

In the recurrence at the primary site we find a very interesting growth in which the greater part closely resembles a carcinoma (Figure 2.) This type of alveolar sarcoma represents the mixed carcinomatous and sarcomatous tumors of many writers. This appearance probably occurs where the formation of cells is very rapid, and there is at the invading border of the growth a nearly typical alveolar arrangement. With its larger cells and many more mitoses the alveolar part of this nodule shows much more evidence of rapid growth than the rest of the tumor. According to Stengel the sarcomata springing from moles or warts give rise to the alveolar forms.

Metastases may be carried by the blood vessels or the lymph spaces about the capillaries. Sarcomata often extend to the neighboring tissues by rows of cells following along around the vessels. Sarcomatous cells in the very vascular nodules are only separated from the blood current by a thin layer of endothelium which is often ruptured; thus the infectious cells or bodies of the tumor reach the blood current. In our case all these methods prevailed. The invasion of the lymph nodes in both groins was through the lymph channels. In the earliest metastases we find the tumor cells in the lymph spaces both inside and around the lymph nodules. The external iliac lymph node on the right was probably infected by direct extension along the vessel wall, which the large isolated vessel near it shows. The tumor was carried to the ileum, the colon, and the brain by the blood current. The fact that the lungs were not infected is a very interesting point, although the tumor cells must have passed through the lungs in order to reach the brain. The lungs are the most common seat of melanotic metastases through the blood. The pigmented nodules on their surface, however, show no evidence of tumor cells. The change of type of this tumor from a melanotic spindle-cell sarcoma to a tubular perivascular sarcoma is most remarkable. Thoma is almost the only one who makes mention of the fact that perithelial (as Thoma terms it) sarcoma may in places form a transition in spindle and round cell sarcomata which show no unusual vascularity. The first sign of this that we noticed is in the second lymph node from the left groin. In this have been described round spaces without any endothelial lining which were bordered by tumor cells. Rarely a few blood corpuscles were seen in them. Similar spaces were noticed in the next nodule described, and their resemblance to the vaso-formative cells of the angioplastic sarcoma was noted. These do not have the appearance of being fat drops and they may represent the origin of the new blood vessels of the tumor. In the next nodule described there is seen the transition stage, a loose cellular growth with no definite arrangement; the cells are more or less arranged along the blood vessels and the whole tissue is everywhere broken up by narrow slits. This

peri-vascular disposition of the cells was a little more clearly shown in a hæmorrhagic nodule near by, and was also very well marked in part of the recurring growth at the primary site of the second case. We see here simply a very vascular growth in which the cells are to some extent clinging about the new formed blood vessels. In the second nodule from the right groin the next stage of this change is shown. Here the cells have increased very rapidly and fill most of the intervascular spaces. It is a simple spindle-cell sarcoma; here and there hæmorrhage has occured, and the cells being clustered about the blood vessels for the sake of nourishment the extravasated blood has filled the tissue between the vessels. With the increase of hæmorrhage the tissue may be broken up, leaving numerous cylinders of cells surrounding blood vessels and lying in a mass of blood corpuscles. (Figure 6.) There is extending out from the vessel wall an intricate net-work of connective tissue fibrillæ between the surrounding cells which serves to hold the cylinders together. Later the extravasated blood degenerates, but no evidence of organization was seen. Fibrin is formed and delicate connective tissue fibrillæ either extend out from the vessel wall or develop in the surrounding masses and surround the cell cylinders. Thus is formed an outer wall of connective tissue which later becomes connected with the inner vessel wall by delicate strands of connective tissue. (Figure 5.) In the smaller nodules where hæmorrhage has occurred this takes place very early. In most of the larger nodules where there is no hæmorrhage the outer wall of these tubules may not be developed. This is especially so in the second case where the growth in the groin was a firm tumor with very little hæmorrhage, and it shows only in places a typical perivascular arrangement. In some growths where there has been little hæmorrhage there is often a rapid cell proliferation, and many tumor cells lie in the intertubular spaces surrounded by blood corpuscles, fibrin and lymphocytes. This has been noted in the cases of Paoli and Driessen. Necrosis often occurs here probably from the lack of nutrition, and this aids in the development of the connective tissue and the formation of tubules. In the oldest

growth, the large one in the right groin, we see the typical tubular type. It is a large tumor with definite capsule, and there has been considerable hæmorrhage and necrosis. The entire growth has been broken up, leaving around the wall a very little sarcomatous tissue which does not show this tubular character. The whole cyst is filled with cell cylinders lying in a mass of blood and necrotic material. The cell cylinders have a definite smooth outer wall of connective tissue. (Figures 4 and 5.) There is no evidence of the hyaline degeneration which often occurs in the cell mantel or the endothelial wall of these tumors.

The nodules of the intestine and in the brain show very young metastases where probably cells brought by the blood current have broken through and developed in the vessel wall or the perivascular lymph spaces. These cells show the same type as those of the original growth. They are in very intimate relation to the blood vessel wall, but in the examination of very many sections no evidence of any proliferation of the endothelial wall was seen, and there was no sign of any change in the type of the endothelium of the cells. The large size and irregular shape of some of these tumor cells close to the endothelium does not in the least signify that they are proliferating from the endothelium; they are simply sarcoma cells that are well nourished and better developed. (Figures 7 and 8.) Malherbe has noted this same fact in carcinoma. In describing spindle cell sarcoma, Malherbe says "Where the cellular proliferation takes place along the vessels we have the perivascular variety of sarcoma. Here the cells close to one another have a luxuriant growth around the vessels as the grass of the prairies along the banks." So this tumor does not seem to be a perithelioma or a perithelial angiosarcoma, but rather a tubular perivascular sarcoma.

Prognosis. The general course of these tumors is that a pigmented growth of long duration suddenly develops rapidly, and after incomplete removal there is a recurrence at the site of operation, and not very much later generalization of the growth, cachexia and death. If the metastatic tumors be situated near the surface, or perhaps on the mesentery, the

tumor may develop slowly. Hæmorrhage may cause a rapid increase in the size of the tumor which then becomes fluctuant. The pressure of the hæmorrhage causes new degeneration. New vessel walls are weakened and new hæmorrhage follows. Thus a hæmorrhagic cyst is formed. In the first case the excision of the primary growth should have included the whole area of pigmented skin. The fact that a second small nodule similar to the primary growth was found near the recurrence at the site of the first operation shows that the tissue was infected beyond the limits of the first excision. The fact that at autopsy the so-called pigmented mole removed from the vulva shows a sutured wound with no evidence of recurrence suggests that the second operation was locally successful. The surgeon should go well beyond the limits of the growth even at the risk of mutilation. It is asserted that the removal of a small pigmented growth often results in the rapid dissemination of the tumor. Van Werts raises the question as to whether the chance of rapid recurrence and metastases is not increased by the operation of removal. We will say that this is probably not so. Whether there is any importance in the fact that tumor cells might be found in the blood during the generalization of malignant tumors or not, it would at least be an interesting study to make on a suspected case. As an aid to diagnosis the value of this process is doubtful.

On reviewing the history in connection with the pathological findings the chief conclusions to be drawn from these cases are as follows:

1. A pigmented growth of the skin may at any time take on malignant characteristics.

2. If the removal of a pigmented growth be undertaken at all, it becomes important for the surgeon to cut wide of the growth, as is the rule in carcinoma. All pigmented tissue should be removed practically in one piece, and without cutting through the tumor tissue.

3. Metastasis may take place from the peripheral organs to the brain, without the lungs being involved.

4. A melanotic sarcoma of the skin may in metastases assume the type of a perivascular angiosarcoma.

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DESCRIPTION OF ILLUSTRATIONS.

(These all represent the first case.)

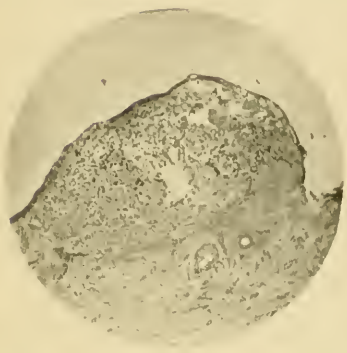


FIG. 1. — Original tumor on Labium. Hematoxylin and eosin. Magnification 35.

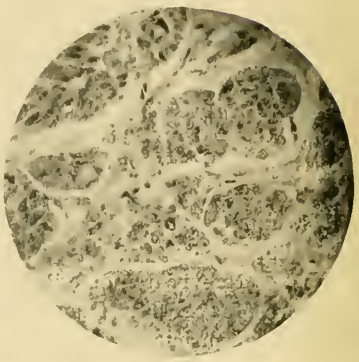


FIG. 2. — Recurrence at primary site. Hemalum and eosin. Magnification 350. Showing alveolar structure and type of cells.

FIG. 3. — Metastatic tumor in groin. Connective tissue stain. Magnification 85. Showing typical tubular growth, and in places new formation of connective tissue.

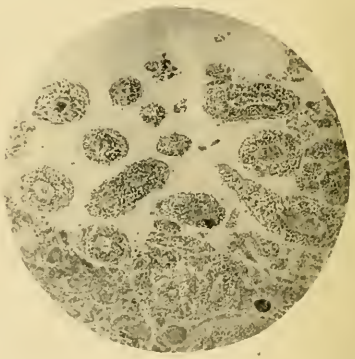


FIG. 4. — Deep inguinal lymph node. Hemalum and eosin. Magnification 45. Very vascular tubular growth.

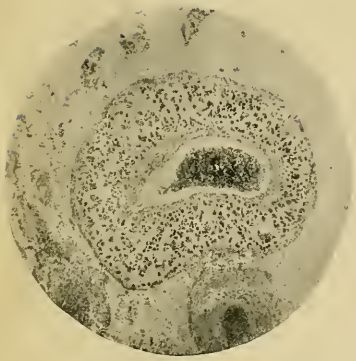


FIG. 5. — Deep inguinal lymph node. Hemalum and eosin. Magnification 150. Showing outer wall of typical cell tubule and the relation of tumor cells to the adventitia.

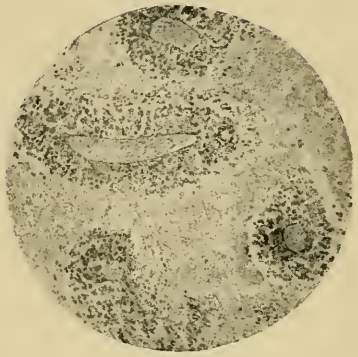
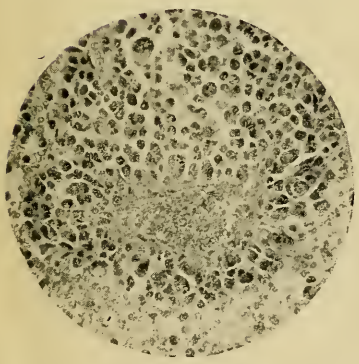
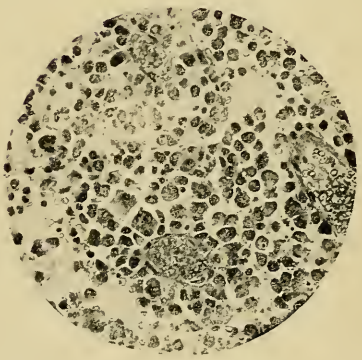


FIG. 6. — External iliac lymph node. Connective tissue stain. Magnification 150. Showing perivascular arrangement of tumor cells and hemorrhage between the tubules.





FIGS. 7 AND 8. — Small metastasis on ileum. Hemalum and eosin. Magnification 350; showing intimate relation of tumor cells to the blood vessel walls on the youngest metastases, the slight tendency to separate into tubules and the intertubular hemorrhage.

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